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INSTRUCTIONS for Beginners IN PHOTOGRAPHY



BY
BENJAMIN WYLES



LONDON

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INSTRUCTIONS FOR BEGINNERS

IN

PHOTOGRAPHY

BY

BENJAMIN WYLES

WITH PREFACE BY

J. HARRIS STONE, M.A., F.L.S., F.C.S.

EDITOR OF THE "AMATEUR PHOTOGRAPHER"

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THE SCIENTIFIC PUBLISHING COMPANY, LIMITED

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PREFACE.

THE strides made by photography during the last few years are little short of colossal. What used to be the business of a few initiated has now become the occupation and amusement of thousands. Hardly any other branch of knowledge has developed so rapidly. Wet-plate photography is itself quite a modern invention; and the easy, efficacious, and reliable dry-plate system, though a mere baby in years, is a giant—strong and lusty—among the many discoveries and improvements which, more than anything else, characterise this latter part of the nineteenth century. Indications are not wanting at the present time to show that still more radical changes are imminent in the various processes of the art.

Wet-plate photography was a troublesome business. To understand it thoroughly in all its details and bye-paths was the work of a lifetime; to dabble slightly in it a labour, or a dallying courtship with

failure and disappointment. In those days—for they can scarcely yet be reckoned by years—there were few who could combine the practice of the art with any other business or occupation, for to be proficient implied a sacrifice of a vast deal of both time and money. Wet-plate photography was a most jealous mistress.

The advent—sudden, swift, overwhelming—of dry-plate photography has changed the whole nature and character of the art, than which no Napoleon could be more revolutionary. Perhaps the greatest and most marked effect of this new discovery is seen socially. Multitudes now rush in where formerly few dared to tread. The whole status of the art-science has been raised, and the future looks even more promising and inviting than the past.

Photography is now within the reach of all, and of all, too, of both sexes. The simplicity, the certainty, the cleanliness, and the satisfactory results obtainable by dry plates have caused photography to be practised as an amusement, or as a helpmate to other branches of art, science, and literature, where its aid was before unknown or seldom evoked. The doctor finds it invaluable for the graphic delineation of malformations, skin and other diseases; the lawyer employs it for registering houses, sites, dilapidations, railway accidents, scenes of murder, and in a thousand other ways. To the architect, surveyor, auctioneer, manufacturer, and retail trader, photography affords the most valuable

and ready assistance. Our illustrated journals are now-a-days largely composed of reproductions directly made by some of the litho or other photographic processes, from photographs taken by amateurs in far distant lands, or from their views taken at or near home. Engineers are more and more employing photography in their profession, not only for the rapid copying of maps and plans, but in the daily or periodical registration of works in progress. Meteorological observations of many kinds are daily being graphically recorded by photography's aid; while for the purposes of war, the art-science now beginning to be used has a magnificent and useful career before it.

With its general advancement, socially, intellectually, and scientifically, there has proceeded a marked improvement all round in photographic apparatus. These improvements doubtless foreshadow still greater advancements. Cameras are lighter, more compact, and better made than formerly; lenses have been cheapened, without any sacrifice of brilliancy or definition; camera-stands have been made lighter, more handy, and more rigid. The future in this direction is a glorious one, and manufacturers of photographic apparatus have every incentive to make fresh exertions. It may be that we shall live to see the camera discarded, and the lens replaced by a simpler and more efficacious optical arrangement. So much has been done in the immediate past, that he were rash indeed who would place a limit upon the

advancements which will take place in the immediate future.

Amateurs have done more, scientifically, for the pursuit they loved than have professionals, and from the labours of amateurs in the future the world expects much. Nor is this expectation likely to be unfulfilled. Among the ranks of amateur photographers are to be found large numbers of the very men from whom improvements are likely to proceed. Some of our most capable scientific men are photographers—some of our most intellectual, our most thoughtful, our most artistic, and, last but not least, some of our most wealthy. But the humblest follower of the art should constantly bear in mind that it most certainly lies within his power to do something to advance photographic science. He should also remember that he can do much to lower its status.

No one need now be deterred from taking up photography on the ground of difficulty. The person of ordinary intelligence can, in these halcyon days of photography, commence with a fair prospect of moderate success. The careful, scientific, and painstaking person can begin with a sure and certain prospect of taking photographs quite up to the average. If this latter type of individual combine with those qualities a carefully cultured artistic taste, he can very confidently look forward to being something more than a photographer, for he will soon become a picture-maker.

Let everyone then who is a beginner enter upon the occupation, whether professionally or for amusement, with reverential feelings, remembering that what is child's play to him now was attained only by his predecessors after much labour and much disappointment. Let him hope and strive to excel. Let all his endeavour be to render truthfully, artistically, and carefully all he portrays. Let him never prostitute his art to mean or ignoble purposes. Let his ideal be a lofty one, and then he need never be ashamed of his efforts, for the ideal photographer implies a man of unusual parts.

A sound knowledge of chemistry, physics, and mechanics has to be combined with great patience, much perseverance, and true artistic feeling. Such are some of the qualities to be desired by him who would be a photographer in the highest signification of the word.

This book has been planned and written to initiate the beginner gradually, steadily, and thoroughly into the art. It premises that he knows nothing of the subject. It does not deal with the more advanced branches, but what it does treat of has been written as simply and as clearly as possible. Some of the chapters have already appeared in the columns of the *Amateur Photographer*, but these have been thoroughly revised, added to, and simplified. Much other photographic information of practical utility has also been added. After the contents of this book have been

mastered, the beginner will find no difficulty in essaying other and higher branches, for his motto should be *vires acquirit eundo*.

J. HARRIS STONE.

HOGARTH CLUB,
December, 1885.

NOTE BY THE AUTHOR.

IT may conduce to the confidence of the beginner to know that the methods, formulæ, and processes set forth in the following pages are the outcome of the every-day practice of the most experienced workers. Variation in result, if it occur, should therefore be attributed to altered circumstances, different materials, or defective working. The beginner should, above all things, distrust his own manipulative infallibility, seeking for the source of error, and trying to understand the principles that underlie method and formula. By so doing, he may rest assured of the ultimate success that rewards the industrious worker.

BENJAMIN WYLES.

SOUTHPORT,
December, 1885.

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Instructions for Beginners in Photography.

INTRODUCTION.

THE business of a teacher is to teach. The writer supposes that those who consult these pages do so with the object of learning what they have to say. It will, therefore, be his aim to tell his story in the simplest and most direct manner, without digressing into the many bye-paths that might, under other conditions, prove alluring. The historic bye-path generally has to be trodden in photographic hand-books. The future outlook is still more interesting to the outsider, if we may judge by the constantly reiterated question, "Will it ever be possible to photograph in colours?" We confine ourselves to the practical working conditions of to-day, the latest advances, and the modes adopted by the best workers. We write for those who, knowing nothing of photography, wish to learn. We shall begin at the beginning, and endeavour to make the conditions and manipulations so clear and easy to understand, that, so far as we are able, success shall be assured.

Many would be glad of an amateur acquaintance with photography, but fear the difficulties, the technicalities, the apparent chaos of manipulations to be learnt or observed. Our object is to smooth the way—to explain the *method* underlying the apparent mysteries—to show the principles that give the clue to a plain path through it all. It is true there is no “Royal road” to photography more than to anything else that is really worth acquiring. Whilst that is so, it is equally true that there is no real difficulty in the way of a person of ordinary intelligence and industry. The one quality for success in photography, above all others, is a capacity for taking pains.

The art is equally well suited to either sex, some few ladies having been amongst the most accomplished manipulators, showing work at the exhibitions which displayed consummate artistic taste, and carrying off awards of honour which were well deserved.

There is now no excuse even for mess and dirt. The necessary chemical operations may be conducted with safety to floors and carpets, and with fingers innocent of ugly stains. Plates can now be purchased ready prepared of the highest sensitiveness and quality. The painter adds them to his sketching material, and secures effects he would not think of even attempting with his brush, or supplements his colour sketch with a record of detail that

would be hopelessly beyond his power otherwise. The architect, engineer, or other technical worker can "bag" records of works on his travels for future use. In commerce, a thousand applications of the art are constantly arising, whilst for the cultivation of the artistic faculty perhaps no occupation presents so sure and tangible results. The observing eye finds material everywhere, and photography enables the ready hand to secure records of present delights for future enjoyment.

CHAPTER I.—CHOICE OF APPARATUS.

THE selection of the working material should have regard to the kind of work the amateur wishes to execute. Tourists will select a size that can be carried without adding much to the fatigues of travel. For home workers the question of weight is of less consequence. Ladies should obtain a set not too large, but with qualities of neatness and compactness that are not at all necessary in the case of a robust man of active outdoor pursuits. Then the matter of *price* is a very variable one. *Complete sets* are purchasable at from forty to fifty shillings for the smaller sizes, whilst as many pounds will often be laid out by the larger professional firms, or amateurs with ample means, in a single piece of apparatus, such as a large lens, or a camera of special size or of peculiar adaptations. The great difference in the cost is not because one maker charges higher than another for the same thing, so much as the great difference in the intrinsic value of the article supplied; and it is not dependent altogether on size. A parallel is seen in the case of a watch: one man gives fifty shillings for his timekeeper, another as many guineas; one is as big as the other; both manage to keep time, or not,

almost irrespective of the cost. Musical instruments afford a similar instance.

Sizes.—There are certain sizes in photography which have come to be adopted as standards, to which plates are regularly made, and for which dishes and other paraphernalia are easily obtainable. To commence with the smaller: the $3\frac{1}{4}$ by $4\frac{1}{4}$, called “quarter-plate,” is popular with beginners, as it allows a lantern slide or a carte-de-visite to be made from the negative, and necessitates a minimum of cost. The next is 5 by 4, giving a plate of rather better dimensions, with very little increase of the weight or bulk. The next is called “half-plate,” $6\frac{1}{2}$ by $4\frac{3}{4}$, and is a very useful size for either landscape or small portraiture. It covers amply for the popular cabinet, or, if the camera contains means for repeating the exposure, two card pictures can be made on it. $7\frac{1}{2}$ by 5 is a useful landscape size, its proportions of length to width suiting well for outdoor work, and being such as artists frequently employ for landscapes. This size was much used in past days for stereoscopic work. A partition down the centre of the camera enables two pictures to be taken simultaneously with a pair of lenses; or the partition being removable at will, a larger lens replaces the pair for taking one picture occupying the full plate. This size is much used. $8\frac{1}{2}$ by $6\frac{1}{2}$, called the “whole plate,” comes next. It is in constant requisition for all kinds of work; it

affords good space for landscape, groups, or a portrait of framing dimensions. A couple of cabinets can be taken on it side by side. Beyond these there are larger sizes, each of them favoured by many of the best workers—10 by 8, 12 by 10, 15 by 12, and occasionally 18 by 16, 20 by 16, and 24 by 20. In this country the extreme sizes have not been quite so much in vogue lately as they were some years since. In America they are popular, and probably will be so again in this country, when a little reaction has passed away that has probably been induced by the great development of the means of enlarging from small negatives.

THE CAMERA.

A word or two as to particular items and the special points to be looked to.

The camera should be bellows-bodied, after the manner of an accordion: the old form, like two boxes sliding one within the other, may be considered obsolete for very sensitive plates. The front part carrying the lens should be able to rise within certain limits, clamping in position with a screw; it should also have motions to either side, and, in addition to the rise and lateral motions, a *falling* motion will often meet exigencies which we shall speak of later on.

The back of the camera should be adjustable either at right angles to the base, or backward or forward; this is called a "swing back," and, though not abso-

lutely necessary, and not supplied in the cheaper instruments, is very desirable for special purposes. For further information on this point, the reader should refer to the separate chapter devoted to the swing back.

The camera should have the power also of taking the plate either sideways or upright. It will be obvious, on a moment's reflection, that some pictures are horizontal in shape—as extended landscapes, others vertical—as church spires, towers, and the like; three or four modes of meeting this are in use:—

1. The dark-slide may be made square, and the plate fixed in it either way.

2. The camera itself may be movable.

3. The best way is to have what is termed a reversing back: the camera itself remains *in situ* with this arrangement, but that part of it to which the dark-slide holding the plate is affixed is made to fit into the camera either way, so that the change from the horizontal to the vertical position of the plate is made in a very few seconds, and without trouble. This is a comparatively recent invention, and, as it implies very careful workmanship, is pretty much confined to the best instruments.

The dark-slide should always be of the *double* form; that is, holding two plates back to back. It is of no consequence whether they are made to receive the plates at the side or for them to be slipped in from one end, but it may be taken that the modern plan of

making the doors to pull right out is preferable to the older plan of having the door hinged so as to fold back. In large sizes, the hinged door left attached to the camera is assailable by wind during exposure, and the hinges are liable to get strained or even torn from the thin wood; and the least defect of this sort is almost sure to produce a chink, through which light can enter, to the spoiling of the plate.

The number of dark-slides will be at the choice of the worker: some begin with one, but it is rather wearisome to be putting in fresh plates after two exposures only, even where access to the dark-room admits of so doing, whilst a limit of two plates in the field is a very close cutting down of one's enterprise. Three slides carrying six plates is a convenient number; six slides with a dozen plates are often taken out, but not often more. A dozen pictures carefully selected, the points of view well chosen and efficiently photographed, will absorb the energy in a day's work with all but the most enthusiastic workers.

THE LENS

Is perhaps the most important item in the outfit. A good lens *may* do with a second-rate camera, but an inferior lens cannot produce a picture better than its own average, however elaborate the adaptations for securing its image. Separate instruments are employed for landscapes and portraits, though

with certain reservations the special instrument of the one may be used for the other. Whatever the form of the lens, it is assumed it will be achromatic ; that is, that its focus, as seen by the eye, will coincide with its chemically acting focus. This is not the case in a lens made from a single piece of glass ; therefore, lenses intended for photography have to be made of two or more separate lenses combined to form one that shall be appropriately adjusted.

Single Lens.—This is the simplest form of photographic objective, it is also the cheapest, and may be reckoned, *par excellence*, the lens for landscape work. Having the smallest possible number of surfaces of glass, it gives the maximum amount of brightness and clearness of image, and, with “stops” sufficiently small and rightly placed, gives sharpness of definition over a wide range of varying distances. It has one particular defect, that of distorting those straight lines that lie near the margin of the picture. For *pure* landscape this is not very observable, but for architecture it is less suitable than other forms. For any purpose, it is desirable that this form of lens should be used as long in the focus as the subject will admit of. The distortion of the marginal lines is thus less seen, and the lens bearing a larger “stop,” or working aperture, vigour of image and speed in working are secured. This form of lens is made by some makers of different focal lengths to fit into one brass mount ; so that, say for a half-plate camera, lenses ranging

from about 8 to 14 inches focus can be carried and fitted into the mount to suit the special subject in hand, and greater power for producing pictorial results is obtained at a comparatively small outlay.

The Portrait Lens is a much more expensive instrument. It consists of two combinations, and has been brought to great perfection for its one purpose. But though this lens is of course necessary in the studio of the professional portraitist, it is scarcely so to the amateur photographer. It is invaluable for its one purpose, but is not of general adaptation. Everything is sacrificed to the one quality—rapidity of action. It has a large amount of roundness of the field, defines badly towards the margin of the plate, and possesses very little depth of focus. For the occasional portrait taken by the amateur the following class of lenses will do well, whilst serving also other purposes :—

Symmetrical and Rectilinear Lenses.—This form of instrument may be imagined as lying midway between the two former. It is of comparatively recent introduction, and is an admirable lens. Some few years ago, Ross introduced what was called the “Doublet,” and, with optical differences which we need not enter on here, this principle has been expanded into a whole family of lenses, which, under the names of “Symmetricals,” “Rectilinears,” &c., are now universally employed. With the exception of strictly portrait work in the studio, this form of lens is

adapted to all purposes, and hence it decidedly forms the proper instrument for the amateur who can only acquire one or two lenses. Its special characteristic is that it entirely corrects the distortion found in the "Single" form. The straight lines of architecture and geometrical designs are produced with absolute correctness. It has also another valuable quality: whilst it can be "stopped down" to cover different planes for landscapes, with larger stops it is admirably adapted for groups of figures or animals, or for the occasional attempt at an outdoor portrait. Decidedly, if only one lens is to be acquired, this form should have the preference, selecting a suitable size from the "Rapid" series.

Stops.—A word of explanation as to the "stops" we have mentioned. These are discs of blackened metal with holes of varying size, and are necessary to secure sharp definition, by cutting off those rays of light that are not brought to a proper focus by the lens. In the single form they are placed in *front* of the lens; in the other instruments they are placed between the two components of the lens by insertion through a slit provided in the brass mount. Each stop produces a considerable alteration, not only in the sharpness of the picture, but in the time of exposure it will require. This is explained under the heads of "Exposure" and "Focussing" later on.

Wide-Angle Symmetricals, &c., are made to cover a very large plate in proportion to the focal length

of the lens. They require so much stopping down as to need far longer exposures than those of the rapid class. They are valuable for use in confined situations ; for instance, say a church has to be taken on a whole plate, the 11-in. ordinary lens would make the picture far too large. You want to get further away, but are blocked by buildings. Changing the 11-in. lens for a wide angle of 6 inches will at once meet the case.

Does the question arise, Why not use the wide angle always, then? Simply because, under normal conditions, it would give the object too small for the size of the plate. It *would* do if you cut down the margin of the picture till it only presents an ordinary angle. Unless this were done, the foreground and all near objects would be unduly magnified at the expense of the distance. In a suitable subject this may be permitted; in an unsuitable subject it would be offensive.

The purchase of a lens is a serious matter to the uninitiated. I would carefully avoid the naming of particular makers of photographic apparatus ; but a lens is an exceptional thing—the various kinds are bewildering to the beginner. We may, therefore, be permitted to say that it is universally recognised that the works of the two eminent English makers, Ross and Dallmeyer, with those of Grubb, of Dublin, may be trusted with absolute confidence. Imported single lenses may generally be expected to work fairly well.

A great many foreign lenses of the symmetrical class are in use, being less costly than the English. A lens has recently been put before English photographers by Suter, of Basle. It possesses excellent features, and the quality of its work leaves nothing to be desired.

A word of caution. When the lens has been obtained, should it be necessary to unscrew its components for cleaning, let one part be cleaned and screwed back in its place before the other is removed; any misplacement of the glasses will spoil the working of the objective.

THE STAND

Is to be carefully selected for its *rigidity*. The variations of the tripod stand are legion, and the special taste of the operator may be indulged, with the one proviso, that it cannot be too rigidly firm. The best of cameras and lenses are brought to nought by a rickety stand. This will prove a nuisance. The danger has been increased of late by the cry for *light* things. In folding stands, which are almost universal, the lightest and weakest part usually forms the base of the leg, with the heaviest and strongest part at the top. This must mean a defect constructively. The evil is not always cured when the leg is made in single unfolding pieces. These may be so springy as to quiver with every breeze. The best form I have found is made of round bamboo, with

the thickest and heaviest part at the foot. Each leg is in two half-length pieces, fitting into each other with bayonet joints. For travelling, the top part slips down into the lower. Though as light as is consistent with due strength, the stand is absolutely firm. The tubular form of the legs prevents any spring or vibration, and gives great strength in proportion to weight. Another form of stand consists of three metal tubes, which, sliding one within another when out of use, form an alpenstock. It is handy in mountaineering, but not very light nor very rigid. Those who would wish not to show their occupation have the choice of a stand that will shut up to a few inches, and can be carried in a small case as if it were an opera glass. Its legs are formed of a thin spiral "shaving" of brass, closing up within itself to almost nothing, but which can be pulled out to four or five feet. With a twist to tighten it, and a ferrule screwed on at each end, it is wonderfully firm. It is perhaps not fair to expect it to compete with a stand frankly made to serve its purpose, without other considerations.

MINOR ITEMS

Will comprise three dishes a little larger than the plates used, a non-actinic lamp, a measure glass or two, scales and weights, and a handy case with strap for carrying the camera, lens, and dark-slides.

THE COST.

In deciding on the expenditure, the choice should bear some relationship to the means of the operator, and to *how far he means to go* in the art. It is false economy to be "penny wise." Photography is an exact science as well as an art, and its instruments in their higher developments cost money. Fortunately, the cheap provisions for the amateurs are extremely useful for the more usual purposes, and the ingenuity of the operator may often still further supplement their possibilities. In few walks of life has amateur mechanical ingenuity been more remarkably shown than in the pursuit of this art.

CHAPTER II.—INDOOR PREPARATIONS.

THE DARK-ROOM.

BEFORE proceeding to active work, the dark-slides will have to be charged with the sensitive plates; but this of course can only be done in the dark—that is, *chemical* darkness, not actual visual darkness. We will therefore, in the first place, explain those qualities of the “dark-room” which are absolutely necessary, and then those which, whilst not imperative, are very decidedly advisable for convenience and ease in working.

It is, of course, universally known that every ray of white light consists of various coloured rays, and that these combined together form ordinary white light. If we filter this white light through different media, so as to intercept some of the coloured rays and permit others to pass, we obtain various results; thus, filtered through a blue medium, the red, orange, and yellow rays will be stopped, but the blue rays, and perhaps some nearly allied with them, will pass, and *vice versâ*. Now the blue and violet rays do the chemical work of light, the red and yellow the heating work; so that any

effectual means of stopping the chemical rays will afford us such a limited amount of coloured light from the chemically inert rays as will enable us to conduct photographic operations in comfort. This end is attained by screening the source of light with yellow or deep-red glass, paper, or textile fabrics, or combinations of them.

When the present extremely sensitive gelatine plates were first introduced, it was found that the thin yellow media then employed for collodion work admitted light that was unsafe, except for slow plates; the new plates were "fogged" by it. To remedy this the deepest ruby was resorted to, and in such intensity as made the dark-room *actually* dark, to the knocking over of bottles, and, worse, to the damaging of the eyes of the operator who spent much of his time in it. Gradually it has been found that this extreme shade is not safer, if as safe, as a more moderate tint, and further, that there is another element besides the mere colour which is a great factor in safety of illumination, that is, the breaking up or *diffusion* of the light, so that a larger amount of light can be admitted through a diffusing medium, such as paper, than would be safe if it came direct through a clear medium, such as glass. The light is also more agreeable to work by, when distributed in all directions. It is further found that yellow is a more pleasant coloured light to work by than a deeper tint. If we can get the yellow sufficiently intense, we may get the comfort almost of the old

collodion days, without its want of safety. This intensity may be obtained by additional thicknesses of the same yellow. The first result, on going into the dark-room so illuminated, is to realise that our thickened yellow looks not yellow at all, but orange; but if we add a layer of *green*, either in the form of paper or glass, the yellow tint is restored, and we have at once a safe and comfortable light by which to work.

Practically, then, we may conduct our operations in any room or place from which ordinary light is carefully excluded, and which is lighted either from a properly protected window, or with one of the many non-actinic lamps sold for the purpose. These lamps are constructed of all sorts of material, and if a "complete set" of apparatus be obtained, one will be supplied with it; but as a special room, with suitably glazed window, will be convenient, it is advised that the ordinary glass be left as it is, and that this be covered with two thicknesses of stoutish yellow paper. It must not be tissue paper, but of a stronger quality; a decided, strong chromic yellow demy is obtainable, equally removed from a lemon or orange colour.

If these are supplemented with a thickness of rolled green glass, such as is now so much used for ornamental purposes, the light will be perfectly safe. If preferred, a sheet of green tissue paper will probably give what is needed. All the papers can be treated

with oil or varnish to render them more transparent. Two materials are in the market, either of which will do without an addition of green—"canary medium," which is a greenish-yellow paper, and "golden fabric," a sort of glazed greenish-yellow calico; two thicknesses of either should be used. Orange papers, or even ruby glass, will serve the purpose, but are less pleasant to work by, and not so safe.

The other necessities of the dark-room are an abundant supply of water, and as much sink room, at which to conduct the various operations, as can be had. Shelving in all available spaces is desirable.

Having shut ourselves up in the room, and waited a short time for the eyes to get accustomed to the light, we should first carefully examine every cranny and chink to see if white light enters. If any does enter, it must be carefully excluded. That done, by the safe light either of the lamp or window we unwrap a box of plates, and, without exposing them to even the safest light more than is requisite, we slip a pair into each double-slide in the frames prepared for them. Observe that the plates have a *right* and a *wrong* side. Place the glass sides towards each other *inwards*, the films facing outwards. Observe, also, if there are buttons for holding the plates in position in the dark-slides, and if so, do not omit to turn them.

The slides are now ready to take out for work, and, with camera and lens, should pack snugly into a strong case. In starting on a journey from home,

always mentally go through the several operations, and tick off in your mind each article, to see that nothing is left behind. It is a revelation, after going a distance, to find that you have got everything *except* the dark-slide and its plates; or you come to focussing, and find the cloth left at home, and have to resort to the undignified expedient of extemporising one by using your coat.

VENTILATION

Is an important point in regard to the dark-room. Many of the chemicals used from time to time emit fumes which, if not injurious, are at least unpleasant, and the gas often burned further increases the necessity; so that ventilation is needed for the sake of health, and also for the actual operations conducted in it. Plates, after washing, will not dry in a close damp place with anything like the speed that they will in a properly ventilated room.

The object will be to get a current of air to pour through without admitting light. This at first may seem difficult, but if it be remembered that light travels in straight lines, and will not be reflected by obstructing media painted dead black placed in its path, modes of keeping out the light, whilst allowing the air to pass round the sides of the obstruction, will be easily adapted to individual exigencies. The writer has employed as *outlets* a manhole in the ceiling, with a wide screen fixed below, to catch any stray rays

that might find their way between the slates of the roof. A hole into a chimney near the top of the room will also serve. The *inlet* should be placed near the floor. The inside should be blackened, and so screened as to prevent the inlet of light, whilst freely admitting air. For light structures, stove piping with a couple of elbows may be used ; but larger openings are advised.

CHAPTER III.—FOCUSSING, LIGHTING,
AND EXPOSING.

ARRIVING at the scene desired, the camera is set upon the stand, in the erection of which there is a right and a wrong mode of procedure. One leg of the tripod should point straight towards the object; then, by setting this in or out, the horizontal line of the picture is conveniently raised or lowered, whilst a touch right or left on the leg at each side of the operator, as he focusses, will adjust the perpendicular lines.

Focussing, or the obtaining of definition or sharpness over the picture, must be carefully attended to. It must be *seen* right on the ground glass. A beginner will find it a little awkward, at first, to examine the upside-down image, but a very little practice will soon rectify that. Of course, the black cloth is always necessary when working in a general all-round light; in a room it may sometimes be dispensed with. Put in the lens a large stop, and examine the image, drawing the camera in or out till the best point is found. In the middle, perhaps, it will be quite sharp, but at the sides "woolly" or "fuzzy." Note points

about midway between the centre and margin, and focus for these. Then put in a stop of smaller size, and see if the picture be fairly sharp all over. When this is achieved, the operation may be considered complete, but the difficulty of it will much depend on the kind of subject. If it be a simple subject, comparatively of one equal distance from the camera, it will be soon done. If, however, it extends over many different planes, especially if the foreground desired to be included approaches very near, perhaps smaller and smaller stops will have to be tried before the best possible result is seen.

If the camera be provided with a swing back or swinging front (the former is much to be preferred), the sharpness should be obtained as far as possible by their use. Objects near the lens throw the image further off the back of the lens than distant objects, therefore the swing back should be so clamped as to accommodate this; and *after* securing all that is possible by this means, the rest can be done by selecting a suitable stop—the *smaller* the opening of the stop, the sharper the picture. But this use of the stops must be carried *no further* than to secure the needed definition, for the brilliancy of the image is injured just as the sharpness is improved. It must be the operator's aim to get as much sharpness as is suitable to the subject in hand, without too much lowering of the intensity of the image; remembering that a very weakly lighted image, even if it is allowed a propor-

tionate lengthening of the time of exposure, will not give so *plucky* and forcible a picture as the more intense image.

The *point of view*, and the adjustment of the image on the screen, open up a very wide range of discussion; we can only say a word or two on the matter. It is the sphere in which the artist's skill is brought to bear. Remember this, that the learner can have no worse adviser than he who asserts that photography is a *mechanical* matter, and that art has nothing to do with it: that you are to "take things as you see them; it is all nonsense trying to make pictures by photography." Men who talk in this way are, perhaps, not so common as they were, but there are plenty yet who deny the possibilities of photography in relation to art. The artist's eye and hand will tell with the camera as well as with the brush. It is true it is not *equally plastic*; but, on the other hand, it has qualities which the hand can never hope to compete with. All the skill and taste that can be brought to bear on the arrangement of the picture on the ground glass will be well spent; the moving of the camera a few feet or yards to right or left, or backward or forward, may make all the difference between a mere ugly diagram, and an artistic, well-balanced picture that may be "a joy for ever."

It is far better to take a great deal of trouble in making a few pictures carefully, than to rattle off a lot of plates, each showing some failing in the

operator's skill. Very few rules can be laid down in regard to this question of arrangement. It may be taken, however, that, as a rule, the centre will be the weakest part of your picture ; therefore, do not place the object of greatest interest there, but a little to either side. Again, if a house or building is the object, a front view "broadside on" will probably present the *least* attractive view. Get it in perspective and a little to one side of the plate, and note that the map soon becomes a picture. The principle applies to ships, buildings, and, indeed, to most things.

Again, don't get the two sides of a picture symmetrically distributed. For instance, a street scene : plant the camera in the middle, and get an equal bulk of buildings on either side, and the result will be hideous. Plant it on one side, and point towards the other, getting in just a little of the distance of the secondary side, so as to slightly balance the predominating mass, and you have a satisfactory composition. All our readers are supposed, of course, to have artistic taste ; it is wonderful, though, how much of it sometimes gets left at home, or at least left out of use, in the excitement of early and sometimes even of later photographic efforts.

The *lighting* of a landscape also affords much room for taste. One or two general principles may be mentioned. The source of light directly behind the camera gives the minimum of shadow, or *flat* lighting ; the source of light directly in front gives the maxi-

mum of shade, with extreme sparkling brilliancy of those points on which the light does fall; relief, or the separation of one plane from another, is got from having the light falling sideways, so that one part, say of a house, is seen brilliantly lighted, the other thrown into shadow; hence it is a somewhat generally accepted axiom to choose such a time of day for taking the object as will present the sun falling obliquely on its principal features, that is, from the right or left of the operator, and not from behind or the front of him. This might perhaps be taken as a rule, if the operator will distinctly understand that it is to be "honoured in the breach" as well as in the observance. Certain subjects will occur in which the direct contrary will be necessary. Instance: a picture is desired of clouds brilliantly lighted—the lens must be pointed directly towards the sun when such are in front of it. Again, the beauty of the rounded forms of trees on a distant hill-side will be best got when the sun is high and in advance of the operator. Again, the gnarled trunks of trees, forming a chief part in the plate, may be got by sun lighting rather in advance of the subject; but the intricacy and detail of the depths of a wood will be best met by giving a full exposure in a diffused or grey light; the addition of sunlight in such a subject will increase the intricacy and confusion, already great. On the other hand, a path or avenue through such a place will gain in charm by the shadows being thrown

directly across it, as they will be by operating when the sun is shining on one side.

Exposing is the next duty, after arranging our picture to the best of our ability. The slide in its place, and the cap on the lens, the door of the dark-slide is withdrawn, always taking care to do this with the cloth thrown well over the whole, and protecting all the parts, from the lens in front to the dark-slide, but especially the slide door and back of the camera, from the intrusion of light. The time of exposure is entirely a matter for the judgment in each particular case. With practice, a general fair average of correctness soon becomes possible. It must be borne in mind there are four separate conditions modifying the exposure—(1) the size of the stop; (2) the intensity of the light; (3) the colour of the object; and (4) the rapidity of the plate.

Stops are often made of such diameters, as each smaller one doubles the exposure required with the one above it. Sometimes, however, they are marked $1\times$, $2\times$, and so on. These are intermediate, the \times indicating that an increase of one-half more is needed. It is to be borne in mind that the time required increases as the square of the aperture of the stop. Thus, if a stop of one-inch diameter required one second, a stop of half-an-inch would require, under similar conditions otherwise, not two seconds only but four seconds, and a quarter-inch sixteen seconds.

Sometimes stops are spoken of in relation to the

focal length of the lens—roughly speaking, the distance from the lens to the ground glass. Thus, a stop of half-an-inch in a ten-inch lens would be represented $\frac{f}{20}$, a quarter-inch $\frac{f}{40}$, a twentieth or fortieth part of the focal length of the lens; this is called the *intensity ratio* of the stop.

The actinism, or *power of the light*, is very variable; it is more chemically active in the months of spring and early summer than later on; it is also more powerful in the early part of the day than in the heat of a summer's afternoon. The effect of smoke or mist is great, being apparently magnified in the camera. An east wind very decidedly lowers the actinism, as it is termed. The presence of "thundery" weather also does this. A shower, however, will often quite alter the conditions for the better.

The *colour* of the object will be a great factor in the exposure required. Yellows, greens, and red are slow or difficult to take. Blues and their allies are rapid. Green foliage requires a long time, especially in a closely-shadowed, dense wood.

The question of *openness* is intimately associated with that of colour; also, what is called atmospheric perspective—*i.e.*, the thin haze that distance gives. All these modify the case. A red-brick house, or smoke-grimed building, will require long, because of its colour; *very* long, if it is shaded by trees. If it stands well open, its colour effect will be modified by the great access of light. Open sea and sky scenes

photograph very rapidly; as quickly, perhaps, as the hand can uncap and replace, using the smallest stop. An open landscape may require a couple of seconds. A near object, as a building or clump of trees, may require from five to ten; close foliage, perhaps twenty or thirty seconds; and we have known views in forests take ten minutes. A deep wooded glen, with high banks and overhanging foliage, may require from one to two minutes. Such places are often to be photographed quicker in winter, when the trees are bare, notwithstanding the decreased power of the light. Close streets or ruins will require even a longer time; and open views, that might only need a moment in the brilliant light of morning or midday, may require several minutes in the waning light after sunset. The great thing is to accustom the eye to judging of the brightness of the image on the ground glass, and go by that, allowing as well as may be for *colour*. A scarlet geranium or yellow sunflower it is hardly possible to photograph. Such things are so non-actinic that they must have all the light you can give them, and very full time.

Rapidity.—The rapidity of the plate is a thing the operator will not need to trouble much about. He will be an exception if he does not at once want the most rapid he can get. This is not advisable. Many makers make plates of two or three degrees of rapidity. The beginner will do best to take the *slower* kind. These will be quite rapid enough, and

will allow of more latitude in exposure, and in other respects be more manageable. The quality of his work in the end will be better for his using plates that can be worked easily and surely, rather than rapidly.

Registering Exposure.—Have the slides marked with a number on each side, so that, having exposed the plate and replaced the door, carefully shading the whole by the cloth, and removed the slide back to the case, *whilst the matter is still fresh in memory*, put down in a pocket-book the number of the plate, the subject, and time given—any other particulars you like, but at least these. Trusting to memory, as to how many plates are exposed in the course of a day's work, will sometimes result in two pictures being superimposed, of course the plate spoiled, and the trouble of making two pictures gone for nothing. In America a dark-slide has been lately brought out, with its pulling-out shutters coated on one side with a silicate composition for writing on. Before exposure, the polished side of the shutter is presented to sight; afterwards it is reversed, and the subject, or any particulars desired, are written on it. It has the great advantage of warning at once, if the operator is about to re-expose a plate.

CHAPTER IV.—DEVELOPMENT OF THE PICTURE.

THIS is perhaps the most important stage in the various processes of picture making. It is here the character of the picture is practically determined; with judgment and skill the success which has attended the previous stage may be heightened and improved, or the adverse circumstances that have attended the exposure may be borne in mind, to be battled with, and often overcome.

Alkaline Developers.—The most commonly used system is called the “alkaline pyrogallie,” and as it permits of management and adaptability to different ends in the greatest degree, the beginner is strongly recommended to master its leading principles, and make it his own from the first.

Three chemicals are used—1. Pyrogallol, or pyrogallie acid: this is really the developer proper. 2. An alkali—either ammonia, soda, or potash: this stimulates to quicker action. It is called the accelerator. 3. A retarding or controlling agent, usually bromide of ammonium, or potassium. The combinations of these three articles are endless, almost every

operator or maker of plates having some pet proportion, or special mode of mixing them. In all, the principle to be remembered is this :—

The pyrogallic gives density, or strength of image.

The alkali gives speed in development, and, in excess, *flatness*, or too much *half-tone*.

The bromide gives slowness of development, and clearness of the picture.

We now give a formula. Take an ounce bottle of pyrogallic acid (pyrogallic being exceedingly light, the bottle is of about 10 oz. capacity); one ounce and a quarter of bromide of ammonium may be added to it; fill the bottle up with water, and drop in 20 drops of pure nitric acid: this is shaken till dissolved, and forms a stock solution, to be called the Pyro stock solution.

Provide two one-pint bottles, but, if possible, take care they are different in shape, so that the hand can feel which it has hold of; into one of these put

Stock solution	...	...	1 ounce.
Water	...	...	19 ounces.

To be called the "P" solution.

Into the other measure—

Liq. Ammonia Fort	...	...	3 drachms.
Water	...	...	20 ounces.

To be called the "A" solution.

These form the actual developing solutions, and must now be used, according to the subject in hand,

"judgmatically." Supposing the plate is a portrait, and known to be properly exposed, or very nearly so, we take, say for a half-plate, one ounce of "P" and a half-ounce of "A" in a glass, and pour the mixed solution gently over the plate. If it be dashed on, bubbles will be formed and stick to the plate; they *may* do so in any case; and as, by sticking to the film, they prevent the image developing in that particular place, a very nasty round hole is caused by each in the subsequent negative. It is well to have at hand a flat camel-hair brush, with which the surface of the plate may be gently stroked once or twice to remove them as soon as they are observed.

A gentle rocking motion is imparted to the liquid, letting it flow to and fro over the plate. About a minute after pouring the solution over the plate, the extreme high lights will begin to make their appearance, the details growing gradually in strength, until, in three or four minutes from the commencement, the pale yellow of the film will be almost entirely obliterated by the various tones of the picture.

On taking the plate from the dish, and looking at its reverse side, the image will be found to show there with some strength, though rather indistinctly; and if the plate is held up to the light, it will be found much too dense to look through. Should these appearances be present, the used developing solution may be thrown away, and, after rinsing, the plate is ready to be "fixed." If, however, instead of coming up so

freely, the image seems to lag, and masses of the yellow film remain without detail, or with detail but very slight and weak, the image requires a little more forcing. Taking the glass, pour into it half-an-ounce of the dilute ammonia solution, and to this pour the developing solution already in use, and then pour all back on the plate; the increase of ammonia will be found to greatly improve matters, and, if it be judged requisite, the dose may be repeated even three or four times—taking care, however, not to drive the developing too far, or an over-dense negative is the result, which takes a long time to print, and gives a chalky white picture, destitute of half-tone. Care, with practice, is the only safeguard against this; but we shall give instructions subsequently for remedying this and other defects.

BRILLIANCY.

Landscapes, Copies, and any work needing special brilliancy or contrast, is gone about with a slight modification of the above. Begin with very little ammonia in proportion to the pyrogallic, say three parts of "P" to one of "A," and watch carefully. Should the image come up at all freely, add pyrogallic solution; on the other hand, should the details not appear, add a few drops of the ammonia solution at a time, but only just enough to make it develop *slowly*, and let this slow building up proceed for some time, then add more ammonia; and, lastly, give the

ammonia solution freely. If the exposure has been right, this treatment will result in a very forcible, "plucky" negative. For *very* special purposes, even this may be supplemented by adding to the solution some dry pyrogallic, though this will rarely be needed.

In cases of *uncertainty* as to the exposure, it is always well to let the plate itself indicate its requirements by beginning slowly; that is, with a large proportion of pyrogallic and little ammonia, say three or even four parts to one, and then add sufficient ammonia as may be needed.

Under-exposure.—Should the image come up very slowly, it may be liberally dosed with the ammonia solution. Should the case be very decided, pour three parts out of four of the original developer away, and make up the bulk again with "A" solution. We now have a very stimulating developer containing very little restraining bromide; and as the tendency in these cases is to "chalky" lights, we shall obviate that to some extent by the very little pyro present. If detail continues to come up, the plate may be left in the dish as long as proves necessary. It may require twenty minutes, or even half-an-hour. No harm will come of the prolonged development—if it is not allowed long enough to get too dense—except considerable discolouration, which must be got rid of after fixing.

Over-exposure is indicated by the too rapid flashing out of the image. The solution in this case had

better be thrown away, and a fresh lot of pyrogallic solution taken, containing less of the ammonia; or the same solution can be continued, but in a retarded condition, by having four or five drops of a twenty-grain-to-the-ounce solution of bromide of potassium added to it.

If the case is a bad one, and the development has advanced to the extent of showing quite sufficient detail, but the whole is flat and without vigour, pour off the developer and wash the plate; to the developer add twenty drops of a sixty-grain solution of citrate of potash, or of citrate of ammonia. This addition of the alkaline citrates has the effect of allowing detail already developed to be built up in strength, but prevents the bringing out of fresh detail.

Cleaning the back of the plate should be seen to before committing it to its final washing. A little common washing salt should be kept handy in the dark-room. The wet fingers dipped into this, and rubbed over the back of the glass, will easily remove any adherent gelatine.

Fixing is the next process. After the plate has been fairly well rinsed, place it in a dish of the following solution:—

Fixing Solution.

Hyposulphite of soda	...	4 ounces.
Water	... ..	1 pint.

This can be used over and over again many times—till it becomes black, in fact. In this solution the yellow bromide in the film is gradually dissolved out. Even when this is completed, the plate should still be left a short time longer, and then removed and well washed for a few minutes. It will now be seen that the film is of a stained yellow tint if examined by daylight, possibly it may be *very* yellow. To remove this, the plate is immersed in the

Clearing Solution.

Saturated solution of alum	...	1 pint.
Citric acid	... ..	1 ounce.

It may require a minute, or from five to ten, according to the depth of the yellow stain, which will vary with the time occupied in development.

This clearing should be done before the plate is submitted to the daylight, or at least before it is submitted to any more light than is just necessary to judge of the colour. Remember strong daylight will fix the stain, after which no length of time in the acid alum will clear the film. After immersion in the "clearing bath" till all yellowness is removed, the plate is well rinsed under the tap, and then placed in a dish of water.

Washing.—The plate should be left to soak for some time, the water being changed at intervals. This final washing cannot be too well performed, and if it can be conveniently continued for some

hours all the better, though this prolonged treatment is not absolutely necessary. Convenient grooved washing tanks are sold, in which a large number of plates can be set up edgeways to wash together, the water being constantly run in from the tap, and let out from the bottom by means of a syphon.

Drying.—When sufficiently washed, the plates are set up to dry in a rack; this will usually take place during the night. This drying must on no account be attempted to be hastened by warming. Of course, the film being composed of gelatine, and in a moist condition, the application of heat *melts* it.

Speedy Drying.—If a plate is needed to be finished off in a hurry, this can be done by immersing the plate in spirit of wine (the common methylated) for a short time, say ten minutes. This done, the negative may be set up in a draughty place, and will be dry in a few minutes.

THE SODA DEVELOPER.

There is a growing appreciation of the qualities of the soda developer by many amateurs of ability. Its steady, gradual mode of working commends it, in preference to the more fiery ammonia, to those who can only recur to photography at intervals snatched from other pursuits. For the following formula I am indebted to Mr. J. Harris Stone, M.A., F.C.S., editor of the *Amateur Photographer*. He has had much experience with it, and the results he is able to show

speak well for its cleanliness and facility in working, as well as for the skill with which it is used.

Stock Soda Solution.

Ordinary washing soda ... half-pound.
Bromide of potassium ... half-drachm.
Water, a Winchester quart (about a half-gallon).

In the developer-measure place an egg-spoonful of dry pyrogallic acid, and pour on it a quarter of an ounce of the stock solution. This is made up to two ounces with water. If required, more of the soda developer can afterwards be added. Clear out the yellowness from the negative, after developing and washing, by soaking in a bath of alum and citric acid, as before directed. The operations succeeding development are of course the same as with ammonia pyro.

THE FERROUS OXALATE DEVELOPER

Is considerably used for negatives on the Continent. We give it here for the sake of reference when speaking of other things, rather than with a view of recommending it for negative work. Its more general use is the development of positives on paper or opal, transparencies, &c.

Saturated Oxalate Solution.

Neutral oxalate of potash, 8 ounces, in 16 ounces of water.

Saturated Iron Solution.

Sulphate of iron, 4 ounces, in 12 ounces of water.

Bromide Solution.

Bromide of potassium, or of ammonium, one drachm, in one ounce of water.

The developer is made by pouring one ounce of the iron into 6 ounces of oxalate solution, adding ten drops of bromide solution. The order of mixing must not be reversed, or decomposition ensues. If needed to quicken development, another half-ounce of iron may be added. On the other hand, more bromide should be added if the picture comes up too rapidly. The best results are obtained by sufficient but *not over*-exposure, and slow development. No detail should show for about one minute after placing the plate in developing dish. When fully developed, washing and fixing follow, as before described. If, however, the picture is a positive on a white ground, as enlargements on opal or gelatine bromide paper, the hypo solution should be new and quite clean; if it is discoloured with fixing pyro-developed plates, it will be almost certain to stain the plate more or less that has been developed with iron. Pyro and iron in conjunction make *ink*, and, as it is all but impossible in practice to get rid of every trace of the developer, the effect is obvious.

VARNISHING.

When the negative is completed, there remains one step—to protect it with a coating of spirit varnish composed of shellac and other gums. The dry plate is held to a bright fire till quite warm, the varnish poured on the plate being gently tilted towards each corner in succession, the superfluous varnish drained off into another bottle, to be filtered back for future use, and the negative dried at the fire with a gentle motion towards the right and left, till the plate is about as hot as can be comfortably borne by the back of the hand, and the varnish is found to be completely set.

DEFECTS AND THEIR REMEDIES.

It is desirable that the worker should have little practical knowledge of faults, or need for meeting them; but, as accidents and abnormal conditions will now and then arise, the necessary treatment is here given.

Frilling.—This is a rising up of the film from the glass, at first in a small place, generally near the edge, extending more or less into the picture. The cause is probably a too soft gelatine used in the manufacture of the plate. When it is seen commencing, use as little ammonia in the developer as will suffice, so as not to aggravate the disease, and then carry through the operations patiently, taking care not to break or tear the frilled-up film. The washing of a frilled

plate should be conducted in a dish by itself, and when finished, instead of setting up the plate to dry, which would leave it quite spoiled by the baggy raised-up film overlapping itself in some places, pour off the water, and, after draining, replace it with methylated spirit, and leave the plate to stand half-an-hour. At the end of that time examine the plate, and the frill will be found to have contracted very much. This spirit may be thrown away, and a little fresh spirit poured over, and left again.

The "frill" will now probably be found to have quite contracted to its normal condition, and be forming a part of the film in its natural position. If it is still refractory, place it again in the spirit, and let it remain till it *has* regained its natural condition. There is no reason to throw a plate away because of this defect, if the film is unbroken.

If it has got torn, much more cautious treatment will be required, giving it only *just* sufficient time in the spirit to contract enough to allow of its being *coaxed* into position with the fingers, or a soft brush, so as exactly to fill the vacant space, without overlapping or falling short and leaving a vacant space. This is rather a nice operation, not adapted for a clumsy person; but photographers, of course, are never clumsy, and it will be easier than it reads in print, if it be remembered that water will make the film *expand*, and spirit will make it *shrink*. A few drops of either, applied locally to the film while the plate is

held in the hand, will allow of considerable adjustment being made.

Blisters are a defect similar in principle to the last, and to be got rid of by the same convenient agent; they frequently, however, when best managed, leave a little spot, or nucleus, rather more transparent than their surroundings. These should be touched out, as far as is practicable, when the film is dry, with a lead pencil, either before or after varnishing.

Bubble Spots.—Sharp round holes arise from air-bells, as described under development. The only treatment is to fill them up carefully with water-colour, so that they will print as nearly like their surroundings as possible.

Crapy lines and net-like markings in the plate.—These arise from insufficient movement of the plate while the developer is acting. If the plate be left standing still in the *early* stage of development, these ugly crapy lines or net-like markings will disfigure the negative. After the operation has advanced somewhat, say half through, there is little danger of these defects. These markings may also be caused by the irregular action of the developer, when an addition of ammonia has been made, and not thoroughly incorporated with the fluid in the film by free agitation. Once formed, there is no *remedy* properly so called. It will show worst in the flat tints of the picture, as the background of a portrait, or the sky of a landscape. In some cases it is possible to help the matter by

working on the plate with the pencil, or vignetting off the damaged background, or stopping out the defective sky.

Dirty fixing marks are irregular marblings that appear as if deposited on the plate. They arise from prolonged immersion in dirty, over-used hypo solution, and will disappear like the more ordinary yellow discolouration in the acid alum bath.

Refusal to fix, in sharp-edged irregular patches, occurs sometimes to plates that have been treated with acid alum *before* fixing, to prevent frilling. The writer has not known it occur where the ammonia developer has been *thoroughly washed out* before the alum treatment, and is therefore easily prevented; but if it arises, wash the plate, and soak it in very dilute ammonia, after which it may be fixed as usual.

We have now considered the process of development, and explained it with perhaps as much simplicity and safety as any operations involving chemical reactions can be. "The wayfaring man, though a fool," *should not* err therein. If all has been performed properly, the resulting negative ought to be a good one, full of soft half tone, graduating into clear shadow at one end of the scale, and into crisp sparkling high light at the other. Such a negative will give a print the operator may be proud of. And we assumed, for the nonce, that this happy result had been achieved, and have given directions for the next step of varnishing such a negative; but, while

we say this *should* be, in actual practice there are many variations from it.

“The best laid schemes o’ mice and men
Gang aft a-gley.”

The most experienced cannot constantly secure it. The beginner is, of course, much more likely to err on one side or the other, getting his negative too thin or too dense; the nervous and hurried will fancy the operation ought to be over before they have given it full time, and so possibly find the plate *thin and poor*. Another, with a taste for rather emphatically doing things, may carry it too far, and find, after fixing, that the detail is *clogged up, and the whole too dense*. Accuracy of judgment as to what is required is very important, and of course practice is the one thing to furnish the wider knowledge. It is an excellent plan, after a good negative has once been secured, to keep it as a sort of standard near at hand and available for reference, endeavouring to make subsequent ones as nearly like it as possible.

In default of this, or other means of judging of the quality of a negative, it may be remembered that, if the plate can easily be seen through in an ordinary light—that is, if, say, the hand can be seen through it generally, and not merely through the deeper shadows—it may be safely reckoned too thin; on the contrary, if considerable spaces are so thick that no detail can be seen in them except by looking through the plate

at a *very* brilliant light, it may be judged too dense. In the following chapter we shall show how to remedy these two faults of thinness and density, so as to bring the plate as nearly as may be to a normal condition.

If, however, the cases are bad ones—*very* bad ones—and there is a chance of making a new negative, this course may be recommended in preference. Nothing ever equals a perfect plate made by what may be called the first intention; moreover, by *going back* to the erring point and rectifying that, the matter is impressed on the memory. This will prove the very best guarantee of its being mastered in the future. But of course there are many, perhaps the majority of cases, in which the plate cannot be repeated, and *doctoring* must be resorted to; and for such cases it is of the greatest importance to have at hand a ready and reliable means of getting what we want.

CHAPTER V.—INTENSIFYING AND
REDUCING.

INTENSIFYING A TOO THIN NEGATIVE.

SEVERAL methods of intensifying a too thin negative have been propounded, but certainly as yet there is none in such general use as the mercurial method. It is certain, and easy to perform, and with proper care there is no reason to consider the negatives thus treated impaired in regard to their permanence, though this has been alleged of some modifications of the process, which we need not here go further into. A saturated solution of bichloride of mercury—or, as it is termed, “mercuric chloride”—is prepared. Some of this poisonous chemical is placed in a bottle, and the bottle filled with water, say a quarter-ounce in half-a-pint of water. The bichloride can be obtained in powder, which will dissolve quicker. *On no account whatever* omit to label the bottle very plainly, POISON. It is one of the most deadly poisons known, and, of course, should not be kept where it can possibly be subject to inadvertence or careless usage.

It is as well, in mentioning a chemical of this poisonous kind, also to name its ready antidote, when it is known to have one. To this poison there is one in a readily obtainable article—no other than the familiar white of egg. This albumen is said to form a perfect antidote, and should be swallowed in considerable quantities—of course, raw—in case of accident.

To return, however, to our legitimate use of the article—the plate is laid in a dish, after thorough washing from the hyposulphite, and the solution of the bichloride poured on it. In a minute or two the film will be observed to grow lighter in colour, and this should be allowed to proceed till it appears quite white when looked at, or, if the plate is looked *through*, it will present a very unpromising appearance, buffish white in colour, and void of any vigour or “pluck.” The solution may be poured back into its bottle, and, if the bottle is not quite full, rinse the dish out with a little water, and pour that into the bottle, and set aside for future use. The plate, and the dish with it, should have a good washing at the tap, and then leave the plate for a time in water in the dish—it is not important *how long*, but if the water is changed once or twice, half-an-hour will do very well indeed. In all chemical washing operations, several changes of water in a comparatively short time are more useful than long soaking in one water.

The plate, being sufficiently washed, is now ready

for the final operation. Take a couple of drachms of liquid ammonia in the measure glass, and add to it two or three times as much water, pouring the water off the plate, which will remain in the dish; gently tilt over it this diluted ammonia. The film will be seen to blacken immediately. The dish may be rocked to and fro for a minute or two, and then, the ammonia being thrown away, the plate is rinsed and soaked in water for five minutes, and may be set up to dry. It will be seen to have increased wonderfully in power and density. A thin negative, utterly unfit for printing, will, after this, yield excellent prints. There are one or two points it may be well specially to emphasise. Take care the negative has had a good clearing in the alum solution, at least sufficient to insure all yellow colour being removed. As all the operations after fixing can be done in daylight, it is quite easy to ascertain this. Then *thoroughly* wash the plate, and again, after the mercury, *thoroughly* wash. After the ammonia there is not such need for copious washing; the ammonia, being volatile, will not remain in the film tenaciously: but the mercury is not so easily got rid of, and it must be all gone before the ammonia is used, or the negative will be clouded and fogged.

The very dilute ammonia that is used with the pyro solution in developing *can* be used after the mercury, but a stronger solution is better, giving greater density to the plate, and ensuring the entire conversion of the

mercurialised silver image—an important matter, as, if this were not effectually done, the negative would become yellow and unprintable.

REDUCING AN OVER-DENSE NEGATIVE.

It sometimes happens that the negative, through development being pushed too far, is so thick that it cannot be printed; or that the print, if obtainable at all, will be *chalky* and hard in the lights, and lacking in quality. A prolonged immersion in the acid alum will remedy this, if it is not an extreme case; but, if it is too far gone for this, recourse must be had to a chemical reducer.

Of these there are several known, as a dilute solution of perchloride of iron, a solution of chlorinated lime, of “ozone bleach,” and others. But the best I have found, and therefore taken into use in my own practice, is ferridcyanide of potassium, or the red prussiate of potash. If prussiate of potash is asked for at the shops, very likely the *yellow* prussiate, or ferrocyanide, will be offered. This will not do; it is the *red* prussiate that is wanted. Some of this is placed in a bottle, and filled up with water, to form a saturated solution. When the negative to be reduced is taken out of the hypo fixing solution—or, if it has been washed before deciding on this subsequent treatment, it had better be re-dipped in the hypo—it is transferred to a dish, and a weak solution of hyposulphite of soda, to which a few drops of the prussiate

solution have been added, is poured over it. Keep this in constant motion, and in two or three minutes observe the effect. If reduction has taken place, but insufficiently, nothing is needed but to continue the process ; but if it should not seem to have produced any effect, pour a few more drops of the prussiate solution into a measure glass : pour back to it the solution in the dish, and return it, thus strengthened, to the plate—and so on, until the reduction is effected satisfactorily. It is only a matter of adding sufficient of the prussiate solution : the effect is certain. But it is desirable to use as little as possible, for two reasons—first, if the mixed solution is not carefully adjusted to the case, the action is almost uncontrollable. It may be asked, Why not give exact quantities ? But this would not meet the varying conditions of each case. The operation must be conducted under careful watching, and the solution kept in movement to prevent partial and patchy reduction. The other reason for using as little as will do the work is that, if much is used, it is rather liable to stain the film a yellow colour, which is anything but good for the printer, especially in dull weather.

These powers of reducing or strengthening a negative are valuable aids in hands that are able to use them ; but they are like edged tools, dangerous if carelessly handled. They should never be resorted to if the negative can be made to print well without them. On the other hand, a negative is not to be

passed on the ground that it "will do," if it can be made better.

Quality is the goal the beginner should aim at; and in photography, as in all art, the quality has to be conceived in the mind before it can be expressed. The results will always be below the standard aimed at. Keep the standard high enough by careful thought, by study of good examples, and analysing these to see in what their merit consists. There is one possible disadvantage, even in the knowledge of accessory powers of improving one's work: the tendency to lean on these supplementary aids may lead to the neglect of making strenuous efforts to secure perfect results by the first intention. Nothing is to be left to these that can be made right at first, once and for all.

CHAPTER VI.—PRINTING.

PRINTING from the negative is a part of photography that scarcely finds the attention from many amateurs that it deserves. The enthusiasm lasts well till the negative is taken; that done, it is often put away in a box till some special circumstance, such as the importunity of a friend, compels the printing to be done. The process is looked on as routine work—drudgery, in fact—and avoided, if possible, or relegated to some one else; perhaps the plate sent to some commercial printer, and so many ordered at the lowest possible price that will pay for material and time. Now this is not the way the “clever ones” have attained their present position. Fine results, that will extort the admiration of one’s friends, and be “a joy for ever,” require brains and care in their production, not only in the first stage, but to the end; and it is only by the best skill in the printing that even the best of negatives are justly represented. Bad negatives require any amount of doctoring and helping in the printing, some of the means to which we hope to indicate; but first let us lay down the plain ordinary track, and it shall be *so* plain that the intelligent beginner shall not find many chances to err.

The mode of printing still in common, almost universal use is that known as *silver* printing. Various other modes, such as carbon, platinotype, &c., are largely used, but they are rather as adjuncts than as rivals to the usual mode. Should the amateur extend his attention to these—and he may advisedly do so—he will still do well to master the ordinary method first, for it is the universal standard of reference and quality, as variation from its results forms the test by which other processes are tried.

SENSITISING THE PAPER.

The basis of the print is albumenised paper. This is manufactured in large quantities, and is an article of commerce universally obtainable. To prepare it for use, it is *floated on*, not dipped in, the following solution :—

Nitrate of silver I oz.

Water (soft or distilled) II „

This solution is placed in a shallow porcelain or other dish; the paper is taken by two opposite corners, and laid gently and quietly down on the surface, the bright albumenised side down; allow it to remain three minutes—a sand-glass is a handy thing to time the floating by, better than a watch; when time is up, one corner of the sheet is lifted by a strip of wood or glass, and being taken between finger and thumb, the sheet is *slowly* raised from the solution, allowed to drip for a few seconds, and then either pinned up to

dry, or, what is better, laid between sheets of clean blotting paper till wanted, when it is completely dried off by a fire, or oven, or gas stove, and is ready for use.

One or two cautions before going further. The size for floating may be quarter-sheet, half-sheet, or, as is the case in large professional studios, whole sheet, the quantity of solution being varied to suit either case; but on no account must any creasing or crumpling of the paper be allowed, or bubbles of air will be formed between the paper and fluid. These air-bells will also occur if the paper is laid *flatly* down—it wants lowering on to the fluid from almost a vertical position. If they do occur, white sharp-edged spots will be found in the prints. Perhaps it is as well, as soon as the paper is laid down, to lift each end once and see; the air-bubble can then easily be touched out, and no harm be done. Lastly, though we give precise directions for floating the paper, we strongly recommend the user of only *small* quantities to buy the paper ready sensitised. This can readily be done now of excellent quality, and perhaps cheaper than it can be prepared on the small scale.

The negative and paper being ready, the former is placed, film up, in the printing frame, and the paper, cut to size, laid face down on it; a pad of paper or felt is laid over it, and the hinged back fastened up, and the frame placed in the best available light till sufficiently printed. This, of course, is judged by opening the frame and looking. It can be examined

in the light, if care is taken not to expose the paper too much, so as to sully the whites. Of course, only one end of the frame will be opened at once, as it would be more trouble than it would be worth to replace the print in its exact position, if once moved out of it. The depth of printing will be right when it looks as if carried *just too far*, the subsequent operations reducing the print a little. Commercial printers frequently place in the frame a *doubled* piece of paper, so that, one print being done, the other fold is turned to the negative, without the trouble of carrying the frame to the printing bench to be refitted with paper.

TRIMMING.

The prints are now trimmed, if that has not been done before printing. Glass-cutting shapes for the various sizes are used, large scissors for sizes that can be conveniently held in the hand, such as cards or cabinets. Larger prints are laid down on glass, the "shape" laid down on it in place, and the edges taken off clean with a sharp knife.

WASHING.

The next stage is to wash out of the prints the superfluous silver not changed in the body of the paper into chloride, or reduced by organic matter in the print. It is simply necessary to stir the prints a number at a time in several changes of water—four or five, if common water is used. The lessening of

its milkiness, after two or three changes, will indicate sufficient washing at this stage. A good deal of the silver used in sensitising is washed out in this preliminary washing, and if any quantity of printing is done, it is usual to throw these waters into a tub, into which a bit of salt is now and then put; the silver, of course, is deposited as chloride, which can be collected and sold to the refiner. When enough is collected on the tub bottom, the water above, left nearly clear, is poured off. The amateur, at least in the day of small things, will not need to trouble about this point of economy, however important it is in larger establishments. Its importance will readily be conceded when we say that silver and gold are the principal expenses in photographic printing, and that of these about 75 per cent. ought to be recovered, when proper care and system are enforced, in the form of waste residues.

TONING

Is the next stage, the object of which is to change the brick-red colour of the print to the well-known warm browns, sepia, or purplish tints seen in different operators' work; and while it is true that modifications of the composition of the toning bath do more or less tend to certain tones, it is to a far greater extent to the working that the variety of results may be attributed. A toning bath that shall not readily vary or get out of order, and that can be used more than just once, is alike demanded by the beginner and by large

establishments, where the work has to be entrusted to other hands than those of the principal. Fortunately, the *acetate* bath fulfils all these conditions, and is second to none in the beauty and the variety of the tones obtainable by its use.

Acetate Toning Bath.

Chloride of gold	...	...	...	15 grains.
Acetate of soda	...	...	...	1 ounce.
Water	...	...	...	3 pints.

The hermetically-sealed tube in which the gold is purchased is placed in a mortar or pot, a little of the water put in, and the tube gently broken. The vessel is repeatedly rinsed with water into the stock bottle, the acetate being added and shaken up. The bath must stand for 24 hours at least before use. For use, 4 oz. of this, containing one grain of the gold chloride, is taken for every sheet of paper that has to be toned. This can be roughly calculated by allowing 32 cards, 16 cabinets, and so on, to the sheet; 6 or 8 ounces of water are added to the 4 oz. of concentrated toning bath, and this water may be employed, warmed in winter, so as to tone at about 70 to 80 degrees of temperature.

The mode of toning is to have the dish in a shaded, but not dark place, and to transfer a few prints to it at a time, and then to the dish of plain water that follows. Only so many should be toned at once as can be kept free from sticking together, and carefully

watched, and instantly removed when they have acquired the "tone" desired. They may take from three or four to twenty minutes, according to the strength of the bath, the temperature, and the brand of paper in use. The prints are to be taken out of the toning, and rinsed and left in clean water, when they reach a colour *just short* of the colour desired: *they go darker as they dry*, so always allow for that deepening, as you allow for the reducing in the printing frame. All this, to the uninitiated, looks mysterious and complicated, but it really is not so in actual practice. The toning done for the day, the solution is set aside, and enough *concentrated* bath added as will restore it to its normal working strength, allowing a grain of gold for each sheet of paper toned. Thus, if about one sheet has gone through, add four oz. of the concentrated solution and no water this time, and the bath will be ready when next wanted.

FIXING.

The next and final *chemical* operation is to treat the prints with the fixing solution:—

Hypo	sulphite	of	soda	...	...	...	4 ounces.
Water	...	...	..	...	...	...	1 pint.

Place the prints in this one by one, well stirring each after immersing. If a print is looked through, after being in the fixing solution three or four minutes, it will be seen to be mottled, from the partial extraction of chloride of silver. The object is thoroughly to

clear the print. They should be kept moving for about ten minutes, after which the remains of the hyposulphite are thoroughly washed out in repeated and numerous changes of water. The final washing is most important, and cannot be too carefully attended to. It is on this, other things being equal, that the permanence or early destruction by fading is supposed to depend, though the conditions of permanency in silver prints are so little understood that it is not well to be too sure here. Certain it is that *long* washing is not to be desired. Many washing machines and troughs with automatic action have been devised, and it used to be common to leave the prints soaking in water all night. That long soaking in stagnant water would be undesirable can easily be understood, the stagnant water being actually only an extremely dilute solution of the hyposulphite at best; but that long soaking in constantly changing water is bad is somewhat astonishing. Yet such is proved true in actual practice; therefore, what is wanted is any mode of washing that will give repeated and thorough changing of the water, in a period of, say, from half-an-hour to one or two hours at most. Some dab the prints with a sponge, squeeze or roll them, and finish off with warm water. These things may be done, if they enable the print to be more thoroughly cleansed; but they are hardly necessary, and the latter is decidedly inimical to the vigour and beauty of the print.

CHAPTER VII.—MOUNTING AND FINISHING.

MOUNTING is done immediately after the prints are washed. They may be piled on a plate of glass, after which the water should be squeezed out; or they may be dried between blotting paper, and mounted at leisure. We prefer the former process—at least for small work. The prints, laid face down on the glass as they are taken out of the water, are squeezed, and dabbed surface-dry with a cloth or a pad of blotting paper, then brushed over with the mounting solution, the top one taken up and placed on its mount, rubbed down upon paper, and so on till the whole are finished; a great number being very quickly done by a couple of persons, one “starching” (if starch is used as the mountant), the other taking up the prints and placing them on the mounts before him. We have named starch. It should be used *fresh*. This is certainly one of the best and least troublesome mounting solutions, but on no account must it be used after standing till it has turned sour. The acid in over-kept starch and gum solutions is certain to attack the print.

Professional photographers use starch, mixing it fresh daily; on the other hand, mounters to the trade, who do large quantities of big prints, are said to prefer thin glue of good quality, such as that sold as Russian glue.

A very excellent mode of mounting large pictures is as follows:—When the print comes out of the water, it is blotted off, and brushed over with thin glue, just sufficient to leave it something like a gummed postage stamp when dry. It is spread out to dry, and at convenience trimmed, then *damped*—not made *wet*—and rubbed down in its place on the mount. A capital surface results, and there should be entire freedom from buckling or cockling, an unsightly annoyance, which is certain to follow if a *wet* print is put on a dry mount with a large margin, unless some comparatively dry mode of mounting, such as that here described, is adopted.

If starch, or other mountant containing a large proportion of water, be used, the mount should be also thoroughly wetted before the print is laid down on it. Then, both being brought together in a swollen condition, there is a better chance of cockling being prevented, both contracting together. Large prints are advantageously dried between dry sheets of blotting paper under pressure, as in the screw-press, to preserve flatness; but they should never remain longer than necessary between papers they have made damp. Moisture is the enemy of permanence in silver

prints, and the sooner therefore the prints, mounted or not, can be dried, and the drier they are kept, the better.

The production of the print, and the placing of it on the supporting card or mount, has been treated of. Some will think these processes are the finishing ones. This is not the case. There is a vast difference between a print at this stage, and what it may be made by appropriate treatment, such as good work regularly receives in well-ordered photographic businesses. Our print, probably, has little spots or points of white which, if an ideal print be examined, will not be found in it; and, further, the latter has a surface much better and smoother. Our next operation, then, is what is called

SPOTTING.

Colour should be mixed to approximate as near as may be to the "tone" of the prints. A mixture is made of such as will come nearest—black, sepia, neutral tint, reds, and others being employed. Nothing is better than Indian ink rubbed up, with enough red—either "Light" or "Indian" will do—or Rose Madder, to warm the tint up to the desired shade; a little gum mucilage is added, and the whole mixed well, and kept for the purpose of removing any white spots, or adding any touches of detail in the picture that taste may suggest. This spotting must be done carefully. Aim at effecting the purpose without

showing that it has been necessary to do it. A smudge of colour, dabbed crudely on the print, is almost if not quite as bad as that which it purports to remedy. Experience shows that, although the work may be somewhat fine, very small brushes are not the best to use. Take a sable of good size, but giving a fine point; this will be much easier to use, and more tender in its handling of the colour; and "red" sables will be found much better and more springy than black ones. It may be found that the surface of the print resolutely refuses to take the colour: in this case a homely but very effective remedy is applied by the trade spotter, who simply wets the surface with the tongue. It is not a very cleanly or elegant act, but it is almost invariably done. If large surfaces have to be treated, it is better to touch them with a very weak solution of prepared ox-gall, or a little of that preparation may be mixed with the colour; excepting that it must be remembered what colour is mixed in that way must be used or destroyed at once—it does not do to dry, as it will not re-dissolve another day.

ROLLING

Is the final operation, whether the print is mounted or kept in its "scrap" condition. Indeed, the unmounted print is almost more improved by well rolling, to give it a perfectly flat and glossy condition, than the mounted one, if the latter has been dried under pressure. A good rolling press is one of the requisites

for turning out pictures in a workmanlike manner. Little need be said about its use, except that unmounted prints should not be rolled alone. A piece of cardboard over the print, which is laid face down on the polished bed, will at once improve the appearance, and protect it from undue pressure at the edges, which would give them a greasy look.

Burnishing is a form of rolling in a special hot press. This treatment is now used for almost all small commercial work. Instead of having a bed-plate on which the print is laid, and thus passed between double rollers, the burnisher has *one* roller, which passes the mounted print, with a dragging sort of motion, over a very highly polished steel bar, previously made hot by gas burning below it. This gives a much higher polish to the surface than by rolling in the ordinary press. The surface, indeed, has almost the closeness of texture of an enamelled print, and is more agreeable in some respects. Before passing the mounted pictures through the burnisher, they are treated with a touch of a lubricant to facilitate their squeezed motion over the polished steel surface. This lubricant is spirit of wine, methylated without gum will do, in which five grains of white curd soap to each ounce, cut into thin shreds, is dissolved: the solution is passed over the print surface with a pledget of cotton wool.

These are the modes adopted in well-appointed studios. It is to be feared the beginner, for whom

we specially write, will not always find himself in possession of an expensive rolling press for large, or a burnisher for smaller prints. He may manage fairly well without, though his work cannot be expected to have the workmanlike look which, with greater advantages, might be secured. We will mention one or two modes by which tolerable results can be got with the appliances at hand in most houses. If the print is of small dimensions, a good surface may be got by laying it down on plate-glass, and well rubbing the back with a hard substance, as the artist's agate burnisher. Again, unmounted prints, and *small* mounted ones with narrow margins, can be laid face down on a smooth surface, and the back well ironed with the laundress's flat-iron made hot. A piece of smooth paper laid over prevents the back of the mount being soiled. Another and very good mode is to use plenty of starch in the mounting, and then, as soon as the print is laid down on its mount, to pass over the surface a round and perfectly smooth and bright roller, such as a large desk ruler. It is rolled over gently and firmly, with just enough pressure to squeeze out the superfluous mountant, and leave an even surface. The mountant is wiped away at the edges with a clean sponge. This mode is in use in some establishments for very large prints, and, where they are carefully allowed to dry afterwards, under slight pressure to preserve flatness, it leaves little to be desired.

ENAMELLING PRINTS

May be briefly described. It is very much admired by some, and as much deprecated by others. It is certain a print must be very good in artistic quality to stand this treatment with good effect. If there be the slightest tendency towards vulgarity, the extremely bright surface given by enamelling—tea-board surface, some call it—will suggest that more attention is paid to the outward conditions than to the art quality of the work. The materials used are collodion and gelatine. Patent plate-glass is rubbed lightly over with powdered talc, or French chalk, and left free from dust. The object of this is to prevent the print sticking to the glass in the final stage. The same end is sometimes sought by rubbing the glass over with a piece of beeswax, and polishing off with a clean cloth, but the talc powder we have usually found most efficient. The glass, prepared either way, is held between the finger and thumb of the left hand, and a pool of enamel collodion poured on the centre. This is flowed to each corner in succession and drained back into the bottle. The collodionised plates may be kept indefinitely for future use, or at once proceeded with. In either case the glass is immersed in water. If recently collodionised, the water must be changed till the greasy appearance arising from the ether and alcohol of the collodion is got rid of; the plate is then lifted out, and, with a little water left

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on the surface, is now ready for having the unmounted print laid down on it. It is allowed to soak for a minute or two in a solution of gelatine—one ounce to a pint of water. The usual mode is to soak dry gelatine in sufficient water to cover it till thoroughly swollen and softened, adding the remainder of the water, and then placing it in the oven till dissolved ; but it should not be allowed to reach boiling point. Into this solution the prints are plunged one after another, taking care to remove adherent air-bubbles. The first put in is then taken out and laid carefully down on the collodionised glass, and this is repeated till all are done. Several may be placed side by side on the same plate, and a piece of india-rubber sheeting or oilcloth being laid over all, a squeegee should be firmly passed over to exclude superfluous moisture and gelatine. Of course, care will be observed not to break the collodion skin which covers the glass. The plates are set up to dry—partially, when the mounts, coated with gelatine solution, are laid down on the backs of the prints in proper position, and the plate again set aside to dry—*thoroughly* this time ; and, when that point is reached, a penknife may be passed round the edge of the print, when it will readily detach itself from the glass, with a surface the exact counterpart of that on which it was laid down ; in fact, the print is virtually a *cast* of the glass surface. Hence the need for using a good sheet of glass, and, if possible, the exquisite surface afforded only by patent plate. Should the

print refuse to leave the glass, it will indicate either a scratchy, bad surface of glass, that it was not properly cleaned, or that the treatment with the powdered talc was not well managed. In either case, to ascertain the cause is to suggest the remedy.

It may be well, before leaving the subject of silver printing, to name a few possible sources of failure which may attend the efforts of the beginner, and to indicate the remedies.

Bad Tones.—Cold, weak, bluish-grey prints, in which no rich vigour can be got, are caused by thin negatives, and over-long time in the toning bath. A plucky negative is the absolutely necessary first step to a good print; but even with this, over-toning and over-timing in the fixing bath will give a cold, reduced, washed-out look.

Want of Vigour.—Prints that have a sunk-in, dull appearance may result from bad paper, but it is far more likely they will arise from the silver sensitising bath being *too weak*, through exhaustion from repeated floatings. It is well to add to the bath, after floating, sufficient of a sixty-grain nitrate silver solution to make up the bulk to its original quantity. Argentometers are sold at two or three shillings each, which, being immersed in the fluid, float a certain height, the figure in the stem at which the fluid stands giving the number of grains to the ounce. Different makes of albumenised paper will bear various strengths of silver to sensitise them with the best results. For-

merly it was quite common to use 60, 80, and even 100 grains to the ounce. Now, the papers are more weakly salted with a chloride, and hence take less silver, 30 grains being frequently used, and 40 seldom exceeded.

Blisters, either large, such as quite lift the film of albumen from the body of the paper, or in the form of numerous minute pimples all over its surface, are sometimes met with. The cause of this annoyance is not well understood, but appears often to be associated with a too *dry* condition of the paper. This may be easily met by laying the quantity required for the floating in a damp place previous to use. A handful of salt in the first washing water, after coming from the hypo fixing bath, is also recommended; but the best treatment, when it persistently occurs, will be to change the paper in use. It is not at all a common defect, and as there is plenty of material free from it, there is no advantage in adhering to the use of the defective article.

Spotty, or mottled prints, in which the colour seems eaten out of the picture, especially in the half-tones and pearly lights, sometimes associated with a yellowness of the print, are generally due to insufficient fixing. The superfluous chloride of silver dissolves somewhat slowly, and anything that retards this will be liable to cause imperfect fixation: hence the prints should be kept moving about in the solution; a clump of them left sticking together for a

few minutes will be certain to remain unfixed. Cold has a retarding effect, so the solution should be slightly warmed in winter. If the print be held up and looked *through* from the back towards a good light, it can be seen if the chloride is only partially removed; but we prefer to trust to an ample margin of time, say ten minutes, and frequent moving the prints about in the solution. As hyposulphite is cheap, and there is a danger of decomposition setting in after it is once used, it is desirable that the solution should always be used fresh for this purpose.

CHAPTER VIII.—INSTANTANEOUS
PHOTOGRAPHY.

IT is popularly supposed that there is some radically different principle, or entirely new departure, in what is called "instantaneous," as contrasted with ordinary photography. This is not the case. Instantaneous work may be considered as ordinary photography working at its best under specially rapid conditions. Thus, with the same plate, and the same lens and camera, it may be quite possible to give a so-called "instantaneous" exposure or a prolonged one, and, if the subject is suited to the work, produce a good picture of it both ways, simply by varying the light, or, what practically amounts to the same thing, controlling the amount of it that reaches the plate, by inserting a small or large stop, or altering the character of the developer. The term "instantaneous" is a bad and vague expression. Practically, it means an exposure ranging from the very shortest that can be given by mechanical means, say the fiftieth part of a second, up to half-a-second, or even a second. Much shorter exposures are sometimes spoken of—the five-hundredth or even one-thousandth

of a second. It is probable such exposures seldom occur: never without such appliances as are not practically useful in the field.

The beginner need not be deterred from attempting work of this character, if he will *select suitable subjects*. It is no use attempting it indoors, with a slow-acting lens, say in a room lighted with an ordinary window. Get a well-lighted landscape, with a good distance, such as would be called *open* landscape; or, better still, a scene composed chiefly or entirely of water and sky, on a bright day. Do not attempt to get moving objects *too near* the front. Give the shortest possible exposure which the hand can make, by lifting the cap upwards from the lens and replacing it as soon as ever the lens has been cleared, and it is probable the result will be a success. The largest stop should be placed in the lens, which will give good definition.

Exposures can be made very quickly with the hand and cap only, when dexterity has been attained by practice. Some of the finest results have been attained by Mr. G. W. Wilson using his own Scotch cap taken off his head. A great many mechanical appliances have been introduced for effecting the object, and one of these instantaneous shutters will be needed if the quickest work is to be done. Some of these are capable of adjustment to various parts of a second.

The simple *drop shutter* is not very costly if purchased, or can be made by an intelligent person for himself. It consists primarily of a piece of wood rather

wider than the lens, and 6, 8, or 10 inches long. A hole is cut into it, which slips tightly on the hood of the lens; in front, runners or grooves are placed at the sides, to form a track down which a very light board or screen will drop with facility. This may be of wood or ebonite, ferrotype plate, or even of blackened card. A hole, as wide and rather longer than the aperture of the lens, is made somewhere about the middle, so that, if it is raised, the light is completely cut off by the lower part; if it is dropped, the opening passes in front of the lens, and makes the exposure, and then, reaching a stud, is held in position so as again to cut off the light by its upper part, which is now in front of the lens. If the amateur proceeds to make a shutter of this description, there are one or two points he should bear in mind: first, the opening of the falling piece should be longer than the diameter of the lens, or the lens will be only for a very small fraction of the exposure at its full working power. It is best to get the necessary rapidity of action, not by the smallness of the opening, but by the rapidity of the fall. This will be attained by making the length of the fall greater before the opening begins to pass the lens. It is well known that a falling body travels slowly at first, and rapidly gains momentum; so that it is possible to vary the exposure, even with the simple drop shutter, within certain limits, by varying the distance which the screen shall fall before it begins to make the exposure.

Another mode of still further accelerating the speed will be found in the use of one or more thin india-rubber bands. A stud or screw is fixed on the upper part of the falling piece, and one on each side of the fixed woodwork: a band stretched over the three studs will pull down the fall much quicker than it would naturally drop. A number of bands may be used in extreme cases, and in this way, combined with varying lengths of drop, considerable variety in the length of exposure is attainable at will. A shutter of this sort may be *slowed* by turning it partially on its side for *quasi*-instantaneous exposures, and for lengthily exposing it may be fixed horizontally, and operated by hand, giving any amount of time.

An important point is the mode of setting the falling shutter in motion. It is difficult to do this without producing vibration in the camera, particularly if the latter be light. Springs that are sometimes applied are very liable to this defect. A good mode, perhaps the best, is the simple expedient of making a very small cut in one side of the falling piece, and having a thin piece of metal to turn like a cupboard button, so as to enter this and hold it up. It should move so lightly that a finger touch turns it out, and allows the piece to drop.

Development is the crucial point in the production of good work of this class. Given the same conditions, two operators will produce widely differing results. Most have a preference for some particular form of

developer. This is not of great importance, but there is one thing of the very greatest importance, that is, *patience*. It is here where most failures will occur. A little reflection will show what very different conditions instantaneous pictures have to be made under, to those which obtain when photographing ordinary subjects. In these a full exposure is given, some parts being comparatively dark, others well lighted. There is comparatively nothing to do but to make a straight march to the victory of the completed picture. But take the supposed instantaneous plate. It has received the briefest possible contact of light in any part: that will militate against getting a strong image. Then every part of the subject has reflected a large amount of light, or it is not fit for instantaneous treatment. This will tend to prevent the shadows having depth. Then a third point will probably present itself in our choosing (and properly so) the most rapidly acting plate we can get, and very rapid plates are necessarily, in their own nature, the most difficult to get contrast in. The tendency is, then, to weakness of light and shade, from the nature of the subject, plus the probable want of contrast in the plate itself. We do not want to weaken our developer too much, because, although that would safeguard the plate against fogginess, we should never be able to get quite an equal distinctness of the weaker details, however much forcing took place subsequently. Neither, on the other hand, must we use a strong

unrestrained developer, or we shall certainly have a quick flashing-out of details, with flatness all over, probably fog over all. But, in any case, no subsequent treatment will make the bad result into a good one. What we have to select, then, is a developer perfectly safe from fogging that particular plate, whilst allowing it to act such a length of time as will enable it to gradually and steadily build up the image.

Supposing ammonia is used—and there is always some advantage in the use of a thing one is accustomed to—it will be well to commence with one-third of the “A” and two-thirds of the “P” solutions, as described under “Development,” and steadily resist the temptation to quicken its action until a considerable part of the picture is out. When it has been in action a long time, with pretty frequent agitation, pour a little more “A” solution into the glass and add the developer to it, and pour back over the picture again, patiently watching. By “a long time” is meant many times as long as an ordinary picture would require. It is impossible to give the time a picture should take, but it may be twenty minutes or half-an-hour, or even an hour may be wanted in some cases. It is not often that pictures with rapid exposures are got with any quality in less than ten or fifteen minutes of development at the least. I like to have a number going on all at once, and to just give them whatever treatment, especially in regard to time, they appear to need. A junior will gladly “assist” by

rocking the dishes, and leave the operator to inspect them alternately, and pass them on to a little stronger solution, or, if finished, to the fixing. When almost developed, should they lack just a little of the desired force, a free addition of ammonia solution may be made. *Now*, there will be no danger of its fogging, though a fourth of the quantity would have done so, probably, at first.

A *preliminary soaking* of the plate in a weak solution, composed of one drop of ammonia to two ounces of water, before developing, has been recommended by Colonel Stuart Wortley. Whether particular plates would prove benefitted by this treatment can only be ascertained by experiment: some of rapid character, only just removed from a leaning towards fog, would almost certainly be *spoilt* by it; others of a slow kind, tending to hard chalky lights and clear glass in the shadows, would no doubt be improved.

But whilst we give the above for ammonia workers, it is by no means meant to be understood that it is specially recommended in preference to other developers for this, or indeed for any work. Liquid ammonia is more used than any other alkali, but that probably arises from its being recommended in the formulæ sent out by plate makers, more than from any careful comparison and adoption on its merits by the worker. There are at least two other developers which, in their steady, gradual, and prolonged action, and consequent power to give density, may be

specially recommended for instantaneous work: one is the soda developer, an excellent form of which has the recommendation of Mr. J. Harris Stone, (*see page 83*); the other is the carbonate of ammonia modification, which is made thus (as described in the *Amateur Photographer*, vol. ii., p. 192):—

Ammonia carbonate	...	...	25 grains.
Pyrogallic acid	...	...	2 „
Water	...	...	1 ounce.

No restrainer is used, but the developer acts slowly, clearly, and with great power of giving density.

Rocking the plate has been mentioned. It is necessary this should be done, at least *frequently*, though perhaps not constantly, as the development progresses. If allowed to stand still immediately after the plate is first immersed, or again after an addition of stronger solution, the inevitable result will be a most disagreeable mottling all over the plate, which will completely mar its beauty, and which cannot afterwards be got rid of. But there is also another reason in the fact of increased vigour attending the properly agitated plate. Why this should be so is not, perhaps, very obvious, but it may easily be ascertained by making a diamond-cut down a plate after exposure, parting it in two, and developing with halves of the same mixture in different dishes, letting one stand still and treating the other as it ought to be. This mode of testing a point is strongly recommended as likely to impress a

fact on the memory, not merely for this instance, but any experimental question which can be served by the principle—of course varying the details as needed.

The important point in the development of instantaneous pictures is, then, *patient, gradual* bringing-out with one of the slowly-acting carbonate developers, or with liquid ammonia most guardedly used, and well restrained with bromide. Unless *sulphite* of soda, not hypo, enter into the developer, the plate may be deeply stained with the prolonged soaking. This will disappear in the final acid clearing. Finally, during the prolonged treatment, keep the dishes protected from light. A cardboard cover to the dish is useful, particularly in the *early* stages; later on, the plate is less liable to fog, and the developer will probably be, by its colour, a protector of some efficacy.

CHAPTER IX.—OUTDOOR PORTRAITURE AND GROUPS.

THERE are three things the beginner in photography almost invariably wants to do: immediately to get the quickest plates possible (naturally the most difficult to work), to take everything instantaneously (which most certainly cannot be done), and to attempt a portrait. Why a portrait should be the most attractive thing to be produced, it is difficult to see; but that it is so, is certain. A hundred things around will pay better for the trouble. Portraiture in photography is an art—an art worked with the utmost skill, needing special appliances, many of them expensive, and assisted at every point by special dodges and plans of working which only long practice can give. Notably, the one process of finally retouching by hand, which almost all portrait negatives receive before printing, would alone be enough to hopelessly prejudice the chance of a result being got that would not suggest unpleasing comparisons. Our advice is to the *very young* beginner, decidedly, DON'T. Aunts, sisters, and cousins are a patient race, but it is well not to try their goodness too much; and you will,

if a portrait is to be the final goal, go about it "judgmatically," and will do it quicker in the end. Practise on something else that cannot either upbraid or pity. Practise on the same thing till you can show good results—not once as an accident, but constantly. There will be no lack of the word of praise from friends when it is deserved; but it is mortifying to find you have tired your friend, only to have been working out a knowledge of your own ignorance of the first conditions of success.

A few directions only is it possible to give; but by carefully observing them, and by intelligent thought, the beginner will find himself on the way to as much success as early efforts can be expected to achieve in this difficult branch of the art.

First, then, the amateur will do well to attempt *figure studies* rather than absolute portraits. The whole of a figure not too near, so as to be on a moderate scale as to size, will not try the resources of the operator nearly as much as portraiture pure and simple. The figure may be associated with some incident or idea, so as to form an artistic picture. The merits of a really tasteful work of this sort will be so appreciated as to carry off any technical shortcomings.

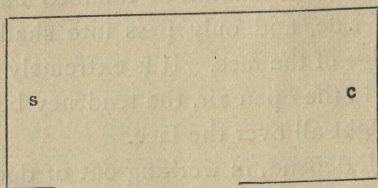
The *lighting* of a portrait will be the greatest difficulty. It is the one point of all others that tries the skill and resources of the professional portraitist with a good glass room at his command. How much more

difficult with no special advantages! What is wanted is to get the light not entirely from the front, which would produce flatness; nor entirely from the side, which would produce a "hatchet face" effect—light on one side, dark on the other—but such a compromise between the two, or mixture of them, as will give a decided preponderance of light to one side, whilst giving a fair amount of rounded half-tones to the further side, and only pass into shadow at the extreme edge of the face. It is extremely difficult to obtain this in the open air, the tendency being to get too much light all over the face.

Much will depend, in working out of doors, on the accidental surroundings. Sometimes these favour the operator, and should be taken advantage of. The angle of a wall, or the corner formed by two buildings, is often available. One of these walls should be made the background, and the face turned, more or less, towards the other wall. If it be now examined, it will probably be found to have some good points of lighting, but spoilt by an overpowering top light falling on the head. This will produce heavy shadows under nose, eyes, &c. It would be well if this could be screened off by rigging something up for the purpose, which should come a short distance in advance of the sitter. A strong light may come from the open side, giving a harsh, sharp effect of light and shade to the face, which could probably be remedied by something in the way of a folding-screen or a

clothes-horse over which a table-cloth or sheet has been thrown. Possibly a strong light may come from the front, full into the face. This, being quite fatal to a vigorous round picture, should either be screened off, or a position selected where it is got rid of.

We have now managed to get an approximation to the following diagram, the lines showing the parts



with the light obstructed entirely, or more or less moderated. If we can place our sitter at s and the camera at c, and can get the top light broken above the sitter, we shall have some probability of getting agreeable lighting.

In some instances the shade on the far side of the face may be too pronounced, which can be modified by a light reflector, such as a white tablecloth thrown across a support. A newspaper opened out, and thrown over a chair, is a good reflector. These may be approached near enough to the face to modify the too deep shadows to any extent desired.

The optical arrangements should be such as admit of the most rapid working attainable. If a portrait lens is to be had, put in a stop—the largest that will give

fair definition. If, as we will assume, there is only a single lens, or one of the rectilinear type, take out *all* the movable stops and examine the image. Probably the "open aperture" will give all that is needed, especially if it is a "rectilinear" or "symmetrical" lens. If really necessary, put in such a stop as will give you the required definition, but keep the lens as open as possible. The exposure can only be ascertained by trial. It may range from one or two seconds to much more.

Groups may be lighted, as far as is practicable, on the same general principles that apply in the case of portraits, except that it should be somewhat *broad*; that is, it may approach nearer to the "all round" effect than would be best for portraits. Grey or diffused light will be preferable to sunlight. If it be a sunny day, a place should be selected on which direct sunshine does not fall, say the shady side of the house. By choosing the time of day, this can usually be done. If sunshine fall directly on the face, it necessarily gives an unpleasant effect in the squinting, half-closed eyes.

The *placing* of a group will tax the best skill and taste of the operator. It involves both technical and artistic considerations—technical in regard to the qualities of the lens used. The figures should be placed so as to approximate to the arc of a circle, with the lens as the centre. Of course, this must not be done obviously, mechanically, but must be

borne in mind whilst placing the figures in accordance with the dictates of good taste, with "art that conceals art." The figures should not be at disproportionate distances, or some will be much out of focus, unless a very small stop be used; and the distant ones would be dwarfed in size as compared with the more prominent figures, especially with a lens of short focal length. If there be a choice of lenses, it is well to use the longest available; it not only covers the plate with a larger aperture, and therefore will require a shorter exposure, but the figures will have a more natural appearance, more of a "life-size look." This effect of using longer lenses does not get the attention it deserves. The improved effect given is possibly due to the fact that the focus of the human eye, according to investigators, is about ten inches, and that the use of shorter foci unconsciously gives an effect of dwarfing. The observer will not reason about it, but he will "know which he likes," when the two things are seen together. This need not deter the possessor of only the small instrument, only let him be doubly cautious of trying to make the short lens cover too large a plate, or of overcrowding a picture by getting too near his figures.

The artistic grouping of a number of figures is a matter about which little can be said here. A few suggestions may be offered. Avoid *formality*. The "all in a row" arrangement only needs to be thought of to be condemned. A group of school children,

row behind row, may interest the fathers and mothers, but not through its artistic planning. Where long numbers have to be got in, *some packing* has to be done, but it should be as irregular and free from set lines as possible. If the formal is ever permissible, it is in military groups. But even here, much may be done by management. A line of soldiers may be taken somewhat in perspective, and the retiring part of the line supported, say by a group of officers towards the front. These are extreme cases: the more usual ones the amateur will meet with are family groups—visitors or friends—and of them he can be master for the time. A well-arranged garden will offer good opportunities, especially if there are bay windows opening on to it, or glass doors, verandahs, &c. Many excellent specimens of good grouping and posing will be found in Mr. H. P. Robinson's work on "Pictorial Photography." A pretty effect may often be obtained by placing one or two figures inside an open window and others outside, as in conversation, especially if the upper parts of the figures only are used. Never allow all the faces to be turned direct to, and staring at, the camera. This must vulgarise the whole thing. If babies or young children enter into the composition, get them disposed in the arms of the elders, and their young heads will be much more likely to remain still if resting on a shoulder or some steady support. Dogs of the small waspish sort are as troublesome as babies, and require similar

caretaking. The larger kind will usually give little trouble.

Perhaps the greatest difficulty the photographer finds in grouping is the irrepressible hilarity of the company. Why a camera should incite to small witticisms, and inopportune explosions of laughter, is a mystery; but that the group-taker will have to put up with it is certain. It is no use to allow it to disconcert and confuse his mind. Let him keep cool, and go on with his preparation without hurry. It may have worked off by the time he is ready; most likely, though, he will find, when the time comes, unnaturally demure faces, and the twitch of a muscle now and then revealing the certainty, if not an intent of explosion the moment the cap is removed. He may *pretend* to make the picture by removing the cap, and so let them "have it out;" but carefully *omit* to withdraw the door of the dark-slide beforehand. It will save a plate, and possibly temper. The announcement that you have played them the trick, instead of being played one, will generally induce a reaction, and show you are not to be played with. The "joker of jokes" should be "sat upon," to the extent at least of putting him in position where he cannot obtain a view of the other faces. Getting him out of sight of the rest of the party will disarm him more than anything.

Calmness, forethought, and good taste will go far towards success in this difficult branch of our art.

CHAPTER X.—CAMERA COMPLICATIONS.

VERY often, on pointing the lens to the subject desired, and looking on the ground glass, the first thing noticeable is that there appears far too much foreground and too little sky. If we tilt the camera upwards, we get the proportion of foreground to sky right; and *if the scene is one in which straight lines are absent*, as in pure landscape, this may be all that is needed. But if there are lines running down the subject, as for instance the straight edges of buildings, we shall find we have remedied one defect only to introduce a worse: all the vertical lines will be running together towards the top of the picture.

To adjust the picture without getting these converging lines, some other means must be found, and, within certain limits, nothing answers so well as the power of lifting the front panel of the camera carrying the lens. This is called

THE RISING FRONT.

It forms a most valuable addition to the camera. The extent of its use is determined by the covering power of the lens. It will readily be seen that as we

raise the lens we bring the edge of its field into play, and if we extend it enough we shall come to the end of that field. In other words, the bottom parts of the plate of ground glass will have thin corners, or perhaps a curved band right across, without any image or light. We have stepped over the edge of the field of the lens. Although the camera makers often give too little rise to the front, it will generally be found sufficient, especially in conjunction with wide-angle lenses for pure landscape. There are subjects, however, where all we can get out of the rising front will not be enough to bring the object agreeably on the plate. We must go back to the tilting of the camera, after all ; and now comes in the use of the vertical

SWING BACK.

This is an arrangement supplied with the best cameras, by which the back portion, carrying the ground glass and plate, can be taken back or forward on the hinges by which it is attached to the camera.

If we bring the swinging back of the camera to the perpendicular, we shall find, if we observe carefully, that the lines gradually regain their true relations, so that, when the back is perfectly straight up, the lines have lost all the objectionable convergence.

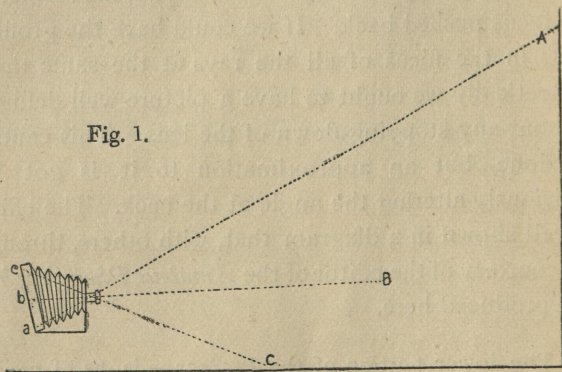
Another use of the swing back is to bring differing planes of the subject into focus. Even with the open aperture of the lens, some portions of the picture may be seen to be well defined ; other portions of the

subject, before and behind the part well in focus, are fuzzy. This is owing to the fact that every object is focussed behind the lens at a point regulated by its distance. A lens is say 10-inch focus, but that lens is only at 10 inches to rays that enter it parallel; practically, things at an immense distance only are focussed at 10 inches, nearer objects are focussed at $10\frac{1}{2}$, 11, 12, 15—the nearer the object, the further is the focus pushed back. If we could have the ground glass in the focus of all the rays at the same time, theoretically we ought to have a picture well defined, without any stopping-down of the lens. This cannot be done, but an approximation to it is got by judiciously altering the angle at the back. The effect is well shown in a diagram that, with others, through the courtesy of the editor of the *Amateur Photographer*, is reproduced here.

“The lower portion of the landscape is, as of course all know, thrown by the lens on the *top* of the ground glass, the middle portion of the landscape on the *middle* of the ground glass, and the upper part at the *bottom*. Now the lower part of the landscape or foreground is generally nearer than the middle portion, and the middle portion is often nearer than the top portion. If, then, we can cause the top of the ground glass to be *further* from the lens than the centre, and the centre further from the lens than the bottom, we may have all three portions of the landscape—the foreground, the middle distance, and the distance—in focus at once. This is readily effected by ‘swinging’ the back, as shown in Fig. 1.

Here *C* is a point in the foreground, *B* is a point in the middle distance, and *A* is a point in the distance—the top of a mountain, for example. The rays from these points will focus at the points *c*, *b*, and *a* on the ground glass, so that we have only to so slope the back that it includes them, and we will have the three points in focus with full aperture of the lens, or, at any rate, with a much larger aperture than would be otherwise possible."

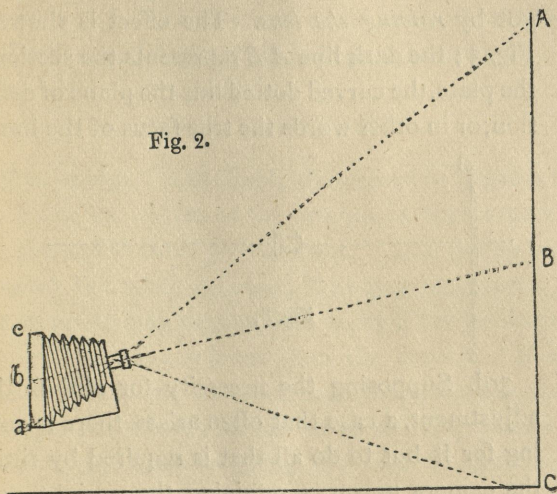
Fig. 1.



One effect of the use of the swing back to get in a high building, with tipping-up of the camera, is not an unmixed blessing. The tilting necessarily makes the front carrying the lens *slope backwards*. If we make the back *perpendicular*, the result is that we exactly oppose the conditions shown in the last diagram. That part of the subject nearest the lens, and requiring the longest focus, actually has to make shift with the shortest. Another diagram makes this clear (see Fig. 2).

To bring all parts of the image into focus, it will be necessary to use a much smaller stop than would be required under less trying conditions.

Fig. 2.



If we have a choice, the question will surely arise which is best to do—to tilt the camera or to raise the lens—in order to adjust the picture on the ground glass. The answer is—

1st. If it is such a subject as will not suffer from dwarfing the upper part, as pure landscape, without near hills, foliage, &c., *the camera may be tilted*. Keeping front and back parallel, this will give the maximum of sharp definition.

2nd. If it is an architectural subject, or any other the upper part of which will not bear dim-

inishing without damage, as for instance a cliff or mountain you wish to look steep, the ground glass *must* be kept upright, the adjustment being got by *raising the lens*. The effect is shown in Fig. 3; the dark line *AB* represents the section of the plate, the curved dotted line the plane of definition, or in other words the true focus of the image.

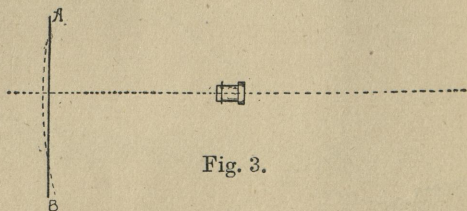


Fig. 3.

3rd. Supposing the necessity for still further adjustment, a case that often arises, there is nothing for it but to do all that is required by tilting the camera upwards, retaining the upright position of the back; but the effect will be as shown

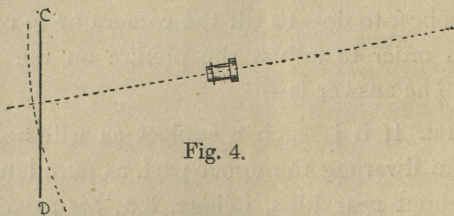


Fig. 4.

in Fig. 4. The curved dotted line again shows the plane of definition, but so far diverging now from the plate that it can only be brought into tolerable sharpness by considerable stopping down.

In some cameras, plans have been adopted to allow *both* front and back to swing. Where this is got without any drawback, it is to be commended. The camera is tipped, the back clamped upright, and then the front sloped forward till it is parallel with it.

THE FALLING FRONT

Is often useful. It is simply the power to depress the lens *below* the centre of the camera, in the same way that the rising front goes *above* it. It is not so often required, but when necessary it is *very* necessary. A case in point may be supposed to be a flat tombstone, or any object much lower than the camera. It will generally be found that, although the camera is made to slope downwards as far as it will go, there still remains the need to bring the lens to the lowest available point.

THE SIDE SWING

Of the camera back is useful for obtaining good definition of such subjects as approach near to the operator on one side only, the other side being at a distance. From what has gone before, it will be understood the near side will throw its focus further away from the lens. The lateral swing allows this to be met by clamping the back, so that it slopes away on that side where the image of the near part falls.

TWO PICTURES ON ONE PLATE.

The old arrangement for this purpose was to have a partition, or diaphragm of folded cloth (like an accordion body), removable at will; but unless for stereoscopic pictures, when usually the pair are taken simultaneously, the plan that follows is preferable, and has been used for years with success. A screen of blackened cardboard is cut to fit closely at the ends into the camera, in front of the dark-slide, but half the width only. The lens being lowered and the screen placed at top, it is obvious a picture can now be taken on half the plate, whilst the other is covered up. Raising the lens and dropping the card will enable the other half to be exposed. If two upright pictures on one plate are desired, turn the card upright, if the camera is *square*; if not, cards to fit it both ways must be kept; and manipulate both it and the lens horizontally. With *two* such cardboards crossing each other, four single pictures may be made in succession, each one-fourth of the plate; or three—one half and two quarters. There need be no fear that the light will travel under the card.

CHAPTER XI.—LANTERN SLIDES, DECORATIVE TRANSPARENCIES, &c.

ONE of the chief pleasures of the amateur photographer is the production of slides for the entertainment of his friends. Photographic slides have almost banished the absurdities that used to do duty in the lantern, and have done much to raise it above its former position as a toy, to that of an educational instrument of the first rank.

Another direction in which the art can be utilised is that of decorating windows with transparencies, and, as these can be made of any size, and either cut or vignetted any shape, this application of amateur work will doubtless become much more general than it is at present.

As the best mode of producing both classes of work is the same, as regards the chemicals used, we will give a formula and a few directions, by which success may be assured in this interesting branch of the art. Of course, the negative development *can* be applied to the making of these positives; but there are certain disadvantages and difficulties, so that a separate departure will save a lot of trouble, as well

as probable failure. A developer is needed for this class of work which will work with more gradual certainty, giving more brilliancy and clearness, and, if possible, permitting great latitude in time of exposure. Such a solution is found in what is known as the *soda* developer. Soon after the discovery of the principle of alkaline development, other alkalies than ammonia were experimented with, and found practical. It was not generally known until recently, however, that different qualities characterised the action of these elements. This is now recognised, and, whilst they *can* be used interchangeably, it is much better to adopt the element for the special work for which its peculiar qualities fit it; hence the use of the slow and sure soda for slides and other transparencies. Two solutions will be required:—

Common washing soda	...	...	1 oz.
Water	...	...	20 oz.
Bromide of ammonium	...	...	8 grains.

Label this "Soda Solution." The other is

Sulphite of soda (not hyposulphite)	128 grains.
Water	... .. 4 oz.

Test this with a strip of litmus paper, and if it remain blue, indicating an alkaline reaction, add, drop by drop, a solution of citric acid, shaking between each addition, till the litmus paper shows signs of turning

slightly red, then add 32 grains of pyrogallic acid, and label this "Pyro Stock Solution for Soda Development." These are now ready for use. Take one drachm of the pyro solution, and add to it seven drachms of the soda solution, and pour the mixture over the plate in a dish: the image should not appear very rapidly, but will be extremely clear and bright; and if the exposure has been right, this clearness will be kept throughout, though the density can be built up to *any* strength almost, by simply allowing sufficient time. Don't attempt to hurry it, but let it go on its own way, observing it at times to see if it has gone far enough, and, of course, agitating the dish when the solution is first poured on, to prevent unequal action.

The decision of how dense to make the picture is the important point here. If it is a lantern slide, take care not to go too far. Have a piece of white card or paper at hand, and, after fixing, lay the slide over it, and observe carefully, remembering the lights must be perfectly clear glass, and the darks crisp and vigorous; if it is flat and veiled all over, expose a fresh one half the time, and try again. The least veil of fog will be quite fatal to its use as a lantern picture.

If the transparency is for window decoration, or for printing a fresh negative from, the developing must be carried much further, a strong vigorous image being a *sine quâ non* for this work, detail being got well into the lights as well as the darker parts.

Fixing the image is the same as for negatives. The alum clearing solution should be used also if there is any staining of the film, but the sulphite of soda in this formula is expressly used to prevent staining.

STEREOSCOPIC PICTURES.

These beautiful results of the camera are not in fashion, but probably will be again, as they well deserve. They are usually produced with pairs of lenses of identical foci, and the pictures reversed in the mounting—right to left, and *vice versa*. The photographer with but one lens may, however, produce non-moving subjects by taking the two pictures one after the other, moving his camera a few inches between each. The two different lenses give pictures from different points of view, and hence stereoscopic relief. Two pictures from the same point would be identical in perspective, and have no relief in the stereoscope. Latimer Clark provided a bar of wood on which the one-lens camera slid sideways. The bar slightly turned on a screw at its centre, to enable the camera to be exactly pointed to the same object from either side. When using a single-lens camera for two pictures for the stereoscope, the picture on the left side of the glass should be taken when the camera is most to the right, and that on the right when the camera is most to the left, which will give prints in their right relative positions without reversal.

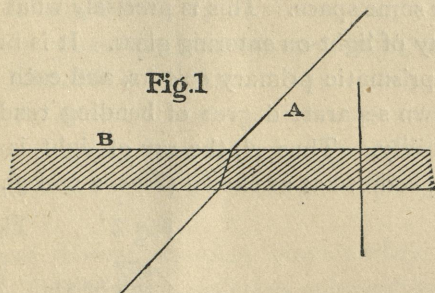
The chemical treatment of stereoscopic work is the same as for other negatives, always remembering that a negative abounding in detail and half-tone is desirable. White in the high lights must be avoided, any crudeness of that sort giving a shady, spotty effect in the stereoscope.

CHAPTER XII.—OPTICAL PHRASES
EXPLAINED.

THE nomenclature of photographic lenses is often puzzling to the beginner ; partly from the unfamiliar scientific terms that appertain more or less to optics generally, and partly from those arbitrary terms that have gradually attached themselves to photographic objectives in particular. This is further complicated by the fact that several opticians have given names to certain classes of lenses, which they make, that are quite different from the names applied by other makers to instruments not much removed from them in outward form or excellence of result. Some of these names get appropriated more widely, as the name "Rectilinear," introduced by a maker to designate his own lens ; which is now applied to lenses having a similar outer form, by various dealers or makers, many of these lenses being of foreign make.

Refraction is the law or property possessed by light of being deflected out of a straight course by the transparent medium through which it travels. It may be illustrated by the familiar effect of dipping a stick into water. It looks bent out of its known

straightness. The ray of light entering glass is really bent. This bending varies with the density of the medium. The ray will travel straight through the medium only as long as the density remains the same: thus, water refracts more powerfully than air, and glass much more powerfully than water; and different qualities or kinds of glass vary much in their densities, and therefore also in their power of bending or refracting the ray of light. *A* (Fig. 1) is a ray of light passing through *B*, a pane of glass. Instead

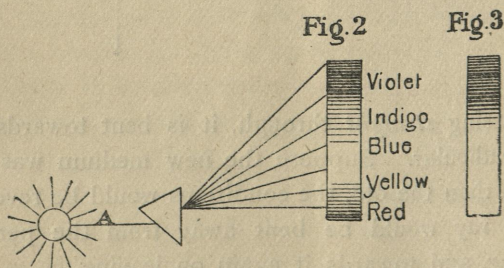


of passing *straight* through, it is bent towards the perpendicular. Suppose the new medium was less dense than the old, the conditions would be reversed—the ray would be bent away from the perpendicular, and towards it again on leaving.

Observe that the deflection takes place at the *surface*, where the ray enters or leaves the new transparent medium. Hence, it is evident that by modifying the surface we can bend the ray about almost at pleasure; and as curved surfaces act in

the same manner as plane, the optician finds here immense powers in the construction of instruments for various purposes. If the ray passes through quite perpendicularly to a *flat* surface, it is *not* refracted.

Chromatic Aberration.—But supposing our stick, named above, was built up of several little sticks bound together, and that on entering the water the binding power was dissolved away, and that each little stick had its own separate degree of bending, it is evident there would be a distribution of the original rod over some space. This is precisely what happens to the ray of light on entering glass. It is broken up into its prismatic primary colours, and each of these has its own separate degree of bending tendency, or refrangibility. Thus *A*, the ray of light, is split up and bent somewhat as shown (Figs. 2 and 3).



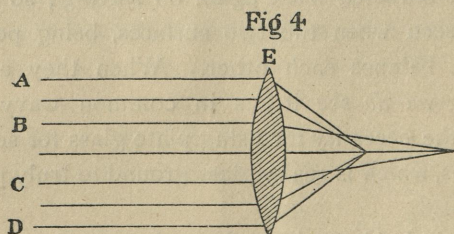
The ray being split up into its prismatic colours by the lens, will give an image with coloured fringes on its outlines. This defect of splitting up of the light is called *chromatic aberration*, and to remedy it in all the better classes of lenses is one of the first

objects of the skilled optician. By employing media of different densities, he manages to counteract the effect. He takes advantage of the opposite qualities of differing kinds of glass to obtain a balance which shall be practically correct in working. The product is called an *achromatic* instrument.

It may be asked, if this splitting up and refraction takes place even with the ray entering an ordinary pane of glass *obliquely*, how is it we do not see it? The answer is that, exactly as it is refracted on entering, it is refracted back again on leaving; so that it is not seen when the two surfaces, being perfectly parallel, balance each other. When they are not parallel, we *do* see it, as in common wavy glass. Hence the necessity for using plate glass for so many purposes, which is really glass ground to truly parallel surfaces.

Spherical Aberration.—Any plane surface of glass refracts differently the different coloured rays, so a rounded surface of glass refracts differently the rays that fall on the *various portions* of its surface, thus introducing a second disturbing power. The rays that fall on the lens near its edge are bent more suddenly than those that pass through it nearer the centre, so that each portion of the lens will bring the rays to a focus at some variation of distance. The following (Fig. 4) shows this in an exaggerated form. The parallel rays *ABCD*, passing through the lens *E*, are brought to a focus at different points, those near

the centre coming to a focus much further away than those near the outside. To remedy this, the curvature of the lens itself is modified: the form giving the greatest amount of this defect, the double convex—*i.e.*, convex or rounded on both sides—is rarely used in photography; the meniscus—convex on one side, concave or hollow on the other—is much preferable. To meet the chromatic or colour aberration, and still further counteract the spherical aberration, each lens for photographic use is really built up of two, or in



some cases as many as three, lenses of different degrees of density and quality in the glass, and of differing curves, carefully calculated to correct or achromatise the instrument. Of course, we are now speaking of the "single" photographic lens. If the lens is a double one, as in "Portrait" and "Rectilinear" forms, each component of the lens will be really a compound built up in this way. Lenses, it is true, are made in which back and front are simple glasses of such qualities, and so curved, that they are intended to correct each other; but the general principle holds good, that

not only will the complete instrument be achromatic, but also each main component of the lens.

Achromatism is of the first necessity in any and all lenses intended for photography. A simple uncorrected lens of glass is not achromatic, but possesses the two faults known as chromatic aberration and spherical aberration. It has been shown that any ray of light entering obliquely a dense medium is bent or refracted out of its straight course; further, that a ray of white light, consisting really of several coloured rays, each of these has its own separate degree of refrangibility, or *bendableness*. The rays thus pass out of the lens more or less separated, and the image is injured by the separating of the rays and by their being broken up into their several component parts.

Foci, Visual and Actinic.—The practical result to the worker of a non-corrected instrument is that the focus of the lens is not where it appears to be. There are really two foci, the *visual* and the *actinic* or working focus. Even costly instruments perfectly corrected for their special work, as telescopic and microscopic lenses, may remain quite uncorrected otherwise; and though they can be, and indeed are, used for photographic work in astronomy and microscopy, it is only by making the proper allowance for the divergence of the visual and actinic foci. The amount of this difference is usually ascertained by experiment, and when found, a mark recorded will show the distance the focussing screen has to be moved with that particular

lens in future. This allowance used to have to be made with many photographic objectives. Now, the universal rule is to make the instrument intended for photography with coincident foci.

Actinism is the chemical action of light as distinguished from its visible effect. Turn back for a moment to Fig. 2 : the spectrum is there represented as it appears to the eye ; but let it fall on a sensitised photographic plate of iodide of silver, and the plate will not be acted on in proportion to the brightness of the several colours, but in proportion to their actinic power. The chief action will take place in the region from indigo to blue ; that portion containing the bright colours green, yellow, red will scarcely be acted upon, and not at all at the brightest spot of pure yellow ; showing that the visible effect on the eye is not at all a representation of the chemical, or actinic power. The intensity of chemical action is shown in Fig. 3, as compared with the visible brightness in Fig. 2. It is a property of bromide of silver, now so largely employed in gelatine dry plates, that it is more sensitive to those lower rays of the spectrum, the green and red, than was the iodide of silver which formed the chief base of the collodion process ; still it is only a question of limited degree—the principle remains. So that the term *Photo-graphy*, light-writing, is not absolutely correct. It is not light in its entirety that does the writing, only the actinic portion of that light.

Angular Aperture is the proportion borne by the working diameter of a lens to its focal length. The wider this is, the less will be the depth of focus and the covering power of the instrument.

Width of Angle.—This refers to the field covered by a lens. Thus, a wide-angle lens will cover about 90 degrees, or a fourth part of a circle; ordinary landscape lenses from 50 degrees to 60 degrees, which is about what the painter usually depicts; whilst the portrait lens gives much less at its best.

Flatness of Field and Roundness of Field.—The image given by the lens naturally is not a plane like the page of a book, but rather like the portion of a hollow sphere. To get it as flat as possible, or to approximate in section to a straight line, so as to fall with the best definition on the photographic plate, is one of the chief aims of the scientific optician. With a view to this, he selects the kind of glass, and calculates the curves of the components of the lens. This, however, cannot be carried out to an unlimited extent, or another evil is introduced called "astigmatism," by which the defining power of the lens towards the edges is injured. Roundness of field is not necessarily a bad quality. A lens with a round field may well serve for half-length portraits and subjects that approximate somewhat to a circular arrangement, as groups can easily be made to do. On the other hand, a lens giving a flat field would be necessary for full-length standing figures taken on a large scale, for the

copying of maps, pictures, &c. A lens of the rectilinear form that is "long in the body"—*i. e.*, has its components widely separated—will, *pari passu*, be flat in the field ; whilst another that is shorter will have a rounded field, but most likely possess much more depth of focus.

Depth of focus is the power of defining well objects at varying distances. Perhaps the theoretical lens is that giving an intensely sharp focus at one point only, everything removed from which is given with differing degrees of fuzziness. To a large extent that used to be the ideal acted upon, till the making of bigger portraits direct in the camera taught photographers and opticians that a theoretic good carried too far may be *practically* an evil. Neither the intensely sharp nor the very fuzzy are desirable in a picture, but such a compromise between the two that shall *look right*, without any suggestion being raised of either sharpness on the one hand or fuzzy wooliness on the other. This rightness that never obtrudes the technical is generally known as artistic sharpness, so far as its optical aspect is concerned. Some portrait lenses have accidentally possessed more of this generalising of the focus than others, or than their maker intended ; but as the taste for larger heads grew, this quality, which had been looked on more or less as a defect, began to be recognised as a valuable adjunct in capable hands, and, with larger figure studies and groups, came to be positively demanded.

Different denominations of lenses are now made expressly to comprise this quality, especially for large work. In small pictures, considerable sharpness is imperative; the further the size is increased, the more may this sharpness be let down, till in very large pictures, especially portraits and figure studies, a judicious softening of the outlines is very decidedly more agreeable than if the whole had sharply cut edges. A glance at any good exhibition of paintings will illustrate this. The best figure-painting will be found, on close examination, to have the outlines very much softened off, yet it will appear quite sharp enough at the proper distance. Precisely the same principle holds true with the photograph when it approaches such a size as will be suitable for viewing at a distance.

Practically, then, the outcome of these considerations is, that for *large* work with varying planes of distance, particularly if intended to be used near the subject, lenses should be chosen that give a sufficient amount of depth of focus. This will not add to the cost, but probably otherwise. On the other hand, small work can scarcely be too sharply defined.

CHAPTER XIII.—NEGATIVES WITHOUT GLASS.

THERE has long been a desire to replace heavy glass plates by some light unbreakable film, particularly for tourists' work. Advances have been made in this direction by various experimentalists. Emulsion of the most sensitive nature is either cut up into the standard sizes, for use in ordinary dark-slides, or, by means of a special roller slide, a continuous web is operated on in succession.

The *developer* used is composed as follows:—

No. 1.

Water	...	...	...	...	...	1 quart.
Sulphite sodium crystals, pure	...	...	...	...	...	6 ounces.
Pyrogallie acid	...	...	...	...	...	1 ounce.

No. 2.

Soda	...	...	...	...	...	4 ounces.
Water	...	...	...	...	...	1 quart.

For use, take—No. 1, one ounce ; No. 2, one ounce ; water, one ounce.

Immerse the exposed paper in clean water, and with a soft camel-hair brush gently remove the

adhering air-bells from the surface. As soon as limp, transfer to the developer, taking care to avoid bubbles by gently lowering the paper by one edge so as to slide it under the surface of the developer.

The image should appear in 10 to 20 seconds, and the development should be carried on in the same way as for a glass dry plate. If the image appears too quick, and is flat and full of detail, add 5 to 10 drops of 1 to 8 solution of bromide of ammonia.

The development is conducted pretty much as one would tone prints, floating about in a dish and with frequent movement. After thoroughly rinsing, they are ready for the fixing, about which there is nothing special to note. The same latitude as to strength of the solution holds as with glass. Then the inevitable washing; and here comes a surprise—they are fully washed in much *less* time than glass plates; the reason, no doubt, being that the water has access to the film from the back as well as the front.

Washing done, the print is gently squeezed, face down, on an oiled glass, and left to dry, when it is readily detached. An alternative mode of preparing the glass is to rub it over with wax, and polish off with a cloth, or to treat it with French chalk powder, as described in the instructions for enamelling prints. The means of rendering the paper transparent is castor oil. A glazed iron dish, such as is used for cooking, is held over a gas ring till the oil in it is "water thin." Into this the prints are plunged,

carefully, with a glass rod; very scrupulously exempting the fingers, for the oil is far over the boiling point of water. In a few seconds after immersion, the print turns darker from the oil penetrating the paper. Nothing remains but to wipe off the superfluous oil with a wisp of cotton wool; the print, lying on blotting paper, is passed through two or three of these wipings, and finished off on the face with a touch of methylated spirit. In lieu of this, the oil may be rubbed on cold, and the print laid on a hot surface till penetrated, or the laundress's flat iron may be passed over it. One point it is rather important to observe—if the negative is dipped in the hot oil as described, it is made very brittle, and must be wiped *carefully*, if done at once; the brittleness is but temporary, and laid aside for half-an-hour the gelatine regains its normal toughness. Another mode of rendering the paper transparent is to lay the print on a hot iron plate, and rub it over, till thoroughly saturated, with white wax or solid paraffin. There is some preference in favour of the oil, as the solid mediums are more liable to show marks from creasing. It may be added that paper takes the retoucher's pencil freely; both sides can be worked.

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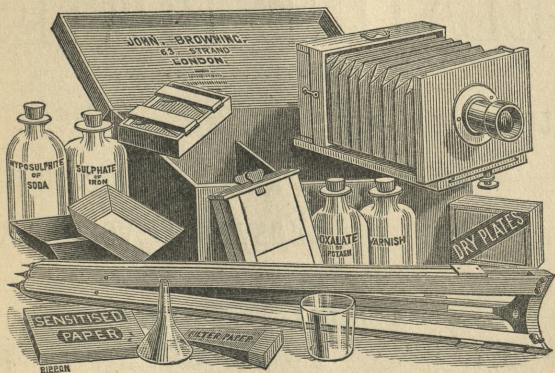
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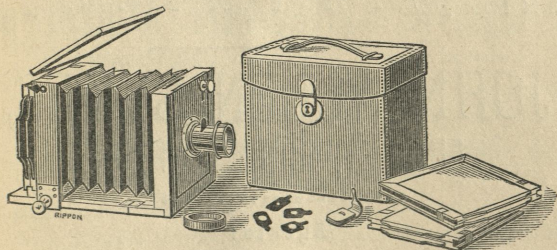
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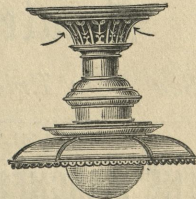
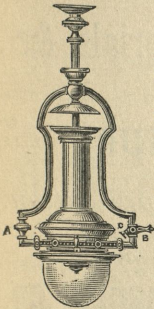
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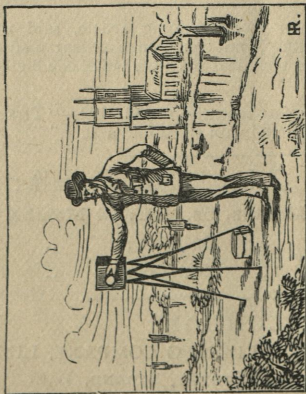
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